Railway Age

DAILY EDITION

FIRST HALF OF 1924—No. 12 CHICAGO—WEDNESDAY, MARCH 12, 1924—NEW YORK SIXTY-NINTH YEAR

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EDITORIAL

Railway Age

DAILY EDITION

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More Human Engineering

A past president of the A. R. E. A., in discussing railway progress in general, stated with some emphasis that the great need today was for more "human engineering." Remarkable results have been obtained through the application of the science of engineering to methods and materials. Too little scientific attention has been given to analyzing the human factor in transportation and studying to use it more effectively—not alone for the selfish interests of the railroads but to the mutual advantage of both parties, as well as the public which is served by the railroads. Fortunately, the events of recent years have tended to bring about a distinct improvement in this respect. While this change has been taking place gradually—so slowly that it has hardly been noticeable—it is beginning to assume large proportions. Today, for instance, there are a number of roads which have officers charged with personnel administration in some form or other, although not always in accordance with the largest interpretation of this term. Such officers on at least two railroads have the title of vice-president and some others report direct to the chief executive. It is true that these officers are going at their tasks in quite different ways and with somewhat different conceptions of the final objective. On the other hand, there are many evidences that executives generally are thinking about and studying human relations questions critically. It is only necessary, for instance, to refer to employee representation on the Pennsylvania; the co-operative arrangement with the shop crafts on the Baltimore & Ohio, which may be extended to other crafts and departments; the bonus for trainmen on the Southern; the personnel department on the Chicago, Rock Island & Pacific; the different forms of working conditions and wage payments to the shop crafts on a number of railroads, and many other developments varying over a wide range which have been adopted, or are being experimented with, by other railroads.

The Conflicting Specifications

One of the problems which now confronts the association arises from a growing conflict in the work of the standing committees. This is to be expected. Certain committees, such as those on Masonry and on Iron and Steel Structures, are concerned with the basic problems of materials and their use in structures in general, while others, such as those on Buildings; Signs, Fences and Crossings; and Water Service are concerned with the application of structures to specific purposes. The plan of organization which governs the work of the association presumes that the two committees dealing with concrete and structural steel are best qualified to develop specifications for design and construction of concrete and steel work and that these committees shall draft specifications which are of sufficiently broad scope to apply to all railway structures. There has been a tendency to depart from this policy. Committees dealing with specific structures have felt called upon to draw their own specifications, using the general forms

as a basis but making such changes as seem to suit their own peculiar requirements. This tendency, unless carefully watched, will result in confusion. A better plan, and one which is pursued at least in part, provides for co-operative action by the committees whereby any deficiencies in the general specifications shall be called to the attention of the committee responsible for it.

Signal Committee Misses an Opportunity

THE REPORT of the Signal and Interlocking committee on automatic train control was a distinct disappointment. This subject is one of the most important ones confronting the railroads today and is big enough to have warranted the committee in presenting authoritative information of practical value to the American Railway Engineering Association. Instead the committee told the Association that "the Committee on Automatic Train Control of the American Railway Association is organized for the purpose of furnishing information on automatic train control to the railroads and officials interested, and that committee will give the information it has available, either on general subjects or any specific subject." As a result, the Signals and Interlocking committee was censured severely on the floor of the convention.

While it is recognized that this subject must be handled with care from the standpoint of policy on the part of the railroads, there are several phases of the train control problem that do not involve matters of policy which the committee might well have reported on constructively for the benefit of the association. Information as to the clearances involved in the location of track elements of the intermittent electrical contact type and of the intermittent induction type of the different devices being considered by the railroads and the effect each may have on track maintenance are some of the points which are of direct interest to the association. The relation which the maintenance-of-way department will bear to the other departments with which it must co-operate in the maintenance of automatic train control equipment, is a subject which will have to be decided by the railroads in the near future and might well receive consideration from this committee.

A few years ago the Signal committee was one of the most active in the American Railway Engineering Association, but more recently its reports have become largely perfunctory. As a consequence, the prestige of the committee has dropped materially and the rebuke which it received from the convention yesterday did not add to its prestige.

The action of this committee is the reflection of what is apparently an attitude among signaling officers to withdraw from participation in the affairs of the engineering department in an effort to build up a department separate from the engineering department. This attitude is particularly to be regretted with reference to train control for this involves several departments all of which must pass upon the subject. The signal department owes a responsibility to the engineering department, of which it is a branch, and also to the operating and mechanical departments, to work closely with them in the study of this subject in order that the viewpoints of all may be considered and the correct solution determined. In direct contrast with the action of the Signal committee may be cited that of the Committee on Wood Preserving, which, although drawn from a group at least equally highly specialized, has utilized its opportunities to maintain and strengthen its contact with the American Railway Engineering Association in order that it may place before the members of the larger organization that information which will enable them to utilize timber preservation more fully.

It is to be hoped that the members of the Committee on Signals and Interlocking will sense the temper of the Engineering Association and compile for it the information which is desired and thereby avoid the necessity for the re-organization of its committee.

Water Treatment, Its Progress and Problems

RECENT DEVELOPMENTS in the science of water treatment have again brought this subject to the front among engineering officers. Approximately 80 installations were made on the railroads of the United States during 1923. This is considerably in excess of the number which have been built in any recent year. It indicates that the railways are coming to an increasing realization of the benefits obtained from thus improving their water supplies.

It is interesting to note that a considerable number of the installations which were made during the past year were on roads which had previously undertaken water treatment. Among these are the Illinois Central; the Chicago, Burlington & Quincy; the Union Pacific; the Baltimore & Ohio; the Chesapeake & Ohio; the Chicago, Rock Island & Pacific; the Chicago, Milwaukee & St. Paul; the Chicago & North Western and the Missouri-Kansas-Texas.

Water treatment is particularly an engineering problem. It devolves upon engineers to conduct the preliminary studies that determine the justification for it. It devolves upon engineers to design and operate the facilities by which it is accomplished. In recognition of this fact the American Railway Engineering Association has for many years included this subject among those assigned to its committees. Indeed, it is in this association that chief attention of any organized character has been given to this subject. The American Railway Engineering Association may, therefore, justifiably claim credit in large measure for the progress that has taken place.

This consideration of water treatment by the association, however, is not without its responsibilities and in looking to the future it is especially important that the association bear this in mind. While water treatment has come to be generally recognized as affording attractive possibilities for the saving of money for the roads, it is equally well recognized by those familiar with the subject that perfection has by no means been reached. The responsibility of the engineer and of the association is not only to remove the imperfections which are to be found in the best of existing designs but to prevent the growth of the impression on the part of non-technical officers that any water treating facilities will accomplish the results desired and that water treatment has reached that point in its development where the close study and thought of the specialized engineer is no longer needed. It is particularly important to guard against a policy on the part of any railroad toward the installation of water treating facilities in which cost alone is the governing factor rather than design. It is also important for the engineering officers to bring their managements to the realization that, however perfect the facility, little can be expected in the way of continued benefits unless the operation is conducted on an organized plan.

An Early Start

The attention of the members of the American Railway Engineering Association is called to the fact that the convention will be called to order promptly at nine o'clock this morning. In view of the heavy program which is to be presented, it is to be hoped that the members will make a special effort to be present at that hour.

* * *

Approximately fifteen officers and members of the American Railway Bridge and Building Association gathered at dinner at the Chicago Engineers club last evening to discuss the work of the association and to receive reports from the chairmen of standing committees.

* * *

Herbert J. Mayer, sales representative with the Hayes Track Appliance Company, Richmond, Ind., has been promoted to sales manager.

* * *

The railway sales division of the National Carbon Company, Inc., and the Presto-Lite Company, Inc., held its annual dinner at the Drake Hotel, on Sunday evening. In addition to the sales forces, several officers and engineers were present as guests.

* * *

The unfortunate death of President A. H. Smith of the New York Central lines has prevented the attendance of many of the officers of that system at the A.R.E.A. convention as the funeral will be held today.

* * *

The early adjournment of the convention yesterday afternoon to permit the members to visit the exhibits was reflected in the large attendance at the Coliseum during the late afternoon and evening. The hall was crowded with railway men who showed more than the usual amount of interest in the materials on exhibit. It was the general concensus of opinion of the exhibitors that yesterday was one of the most successful in the history of the Appliances Association.

* * *

Edwin F. Wendt holds an enviable record for convention attendance, having been present at every annual meeting except one, that of 1917, when he was detained at Washington because of the threatened strike of train service employees.

* * *

The members of the Executive committee of the American Wood Preservers Association met at the Old Colony club at the Hotel La Salle yesterday to select the personnel for the ensuing year. At the conclusion of the meeting approximately forty members of the association, and others interested in the treatment of timber, gathered at the Builders' club for dinner. During the evening the suggestion that the railways send selected employes to the Forest Products Laboratory, at Madison, Wis., for a short course in the fundamentals of timber preservation was discussed at some length.

* * *

Friends of George Frank Konald, general manager and treasurer of the Warren Tool & Forge Company of Warren, Ohio, were shocked to learn that he died in a hospital in that city on March 3, from complications following an operation. Mr. Konald had been associated with the Warren Tool & Forge Company since 1911, when it was organized by his brother, M. J. Konald and J. D. Robertson. He had previously had a long experience in the manufacturing field with the Iron City Tool Works. Mr. Konald was 59 years old at the time of his death.

* * *

Robert W. Hunt Company, Chicago, has prepared for distribution a leaflet giving the heat number stamping and branding of steel rails in effect at the various mills on January 1, 1924. This shows the character and location of the brands and their indication. With it one is able to identify any rail readily.

* * *

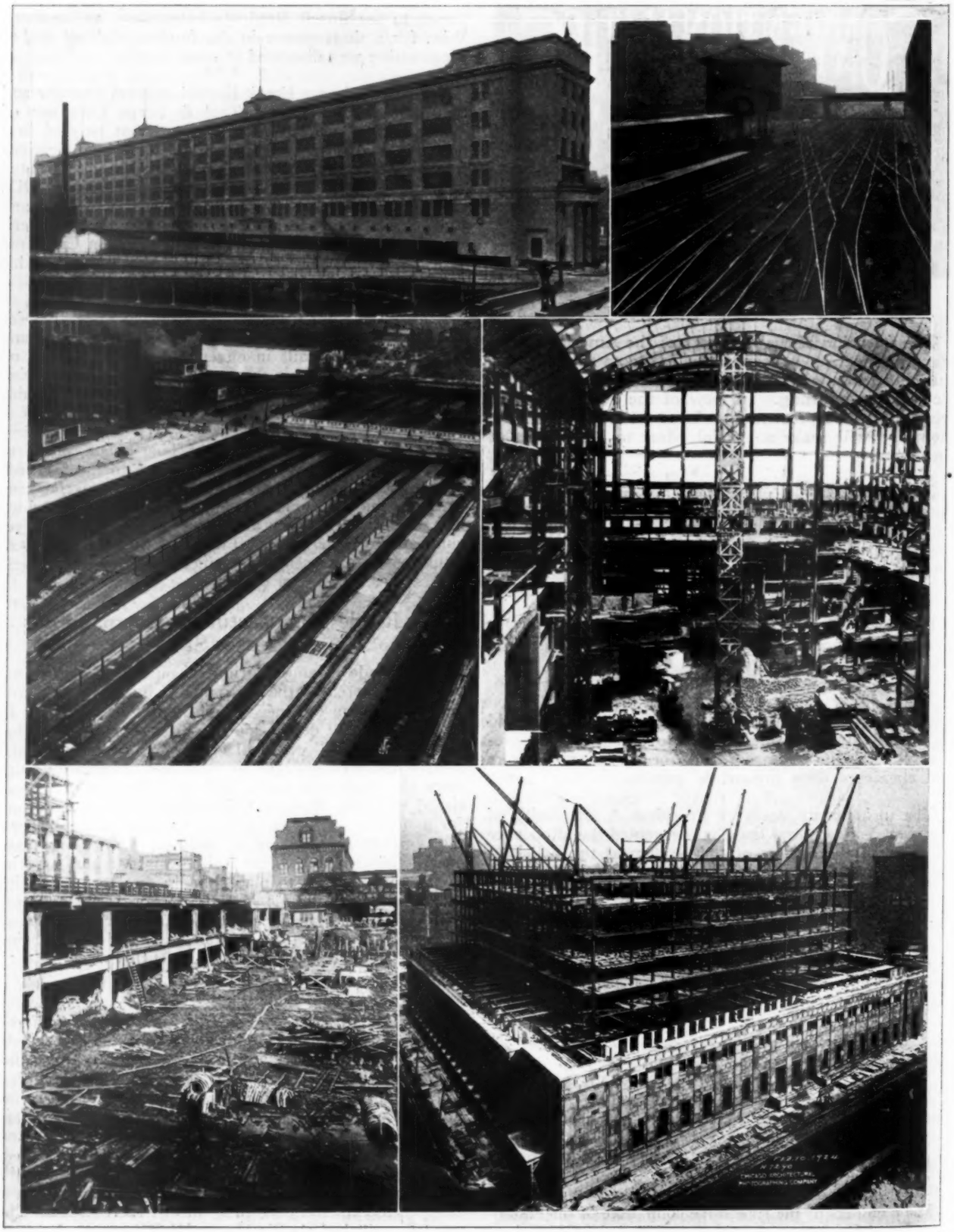
That broad smile on the face of Tom Lehon, president of the Lehon Company, Chicago, is due to the fact that he has just received the contract for the waterproofing for the vehicular tunnel under the Hudson river, which will connect New York and Jersey City. This will require approximately 225,000 yards of Mule Hide asphalt saturated cotton membrane and is one of the largest orders of its kind ever placed.

Reade Manufacturing Company Increases Staff

The Reade Manufacturing Company, Jersey City, N. J., has increased the personnel of its railroad department by adding two new members to the staff. F. E. Norris, who will devote himself to sales and advertising and E. E. Prarie, who will be engaged in selling. Mr. Norris has been engaged in sales and advertising work since his graduation from Yale in 1908. He was associated with the Monroe Calculating Machine Company for a number of years, first as assistant to the general sales manager and later as assistant advertising manager. This connection, as well as his previous associations, were such as to place him in direct contact with the railway sales field. Mr. Prarie has been connected with the Reade Manufacturing Company's chemical weed killing activities for the past four years and is now being transferred to the railroad department.

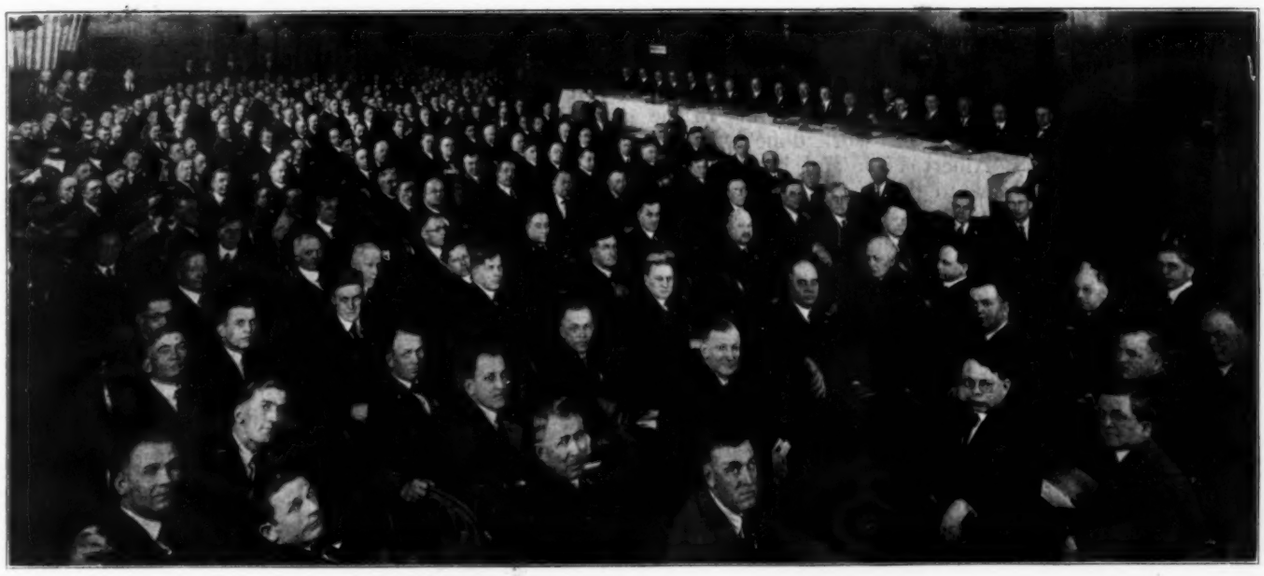
Something Different

The demand for tickets for the annual dinner of the Engineering association, which will be held in the Gold room of the Congress hotel this evening, has exceeded all records. More than 600 tickets had been sold last evening, filling the main floor and the balcony and overflowing into the reception room. Only a few more seats are available and those will be sold to the first applicants. This demand indicates that those in attendance at the convention are taking a keen interest in the program which, as has been announced, will be "something different" from the programs of recent years. The speakers will include Sir Henry W. Thornton, chairman of the Board of Directors and president of the Canadian National railway system, Fred W. Sargent, vice-president and general counsel of the Chicago & North-Western and James Schermerhorn, humorist, lecturer and writer and former editor of the Detroit Times.



New Chicago Union Station Is Nearing Completion

At the top are views of the Mail Terminal Building and the south interlocking plant which was put in service on March 1. In the center are photos of the station tracks equipped with temporary sheds and the main waiting room. At the bottom is a view of the foundation work for the concourse with the old station in the background and a picture of the head house as it looks today



The A. R. E. A. in Session Yesterday Afternoon

Engineering Association Holds Busy Sessions

A Large Number Were Present on the Opening Day— Nine Reports Were Presented and Discussed

EVERY SEAT IN THE Florentine room was taken and many were standing when E. H. Lee, president of the American Railway Engineering Association, called the twenty-fifth annual convention to order shortly after nine o'clock yesterday morning. After reviewing the work of the past year and making a number of constructive suggestions for future activities, President Lee called for the reports of the secretary and treasurer, which were presented. The association then began the consideration of the reports of the standing and special committees, including those on Ballast; Ties; Buildings; Wooden Bridges and Trestles; Signals and Interlocking; Water Service; Economics of Railway Location; Uniform General Contract Forms and Standardization.

Address of President E. H. Lee

I RISE TO ADDRESS this convention with the same sense of pride and pleasure that I have felt during the last twelve months in representing a body of men who stand for the highest type of efficient and honest work both in principle and practice.

It is with great regret that I have to tell you that the association has lost thirteen members by death during the year. Prominent among these are Doctor Dudley, Robert W. Hunt, J. W. Kendrick and J. G. Rodgers. In their records of achievement as engineers and railroad officers these men who have gone have left a lasting inspiration for us who remain.

I shall not discuss the statistics of the growth of the Association, though the record of its advance in the 25 years from a handful of men to a membership of over 2,000 is in itself notable, nor its financial status, because the reports of the secretary and the treasurer cover that information. Neither shall I dwell at length upon the fine results accomplished for the Association through the outstanding work of its various committees; except to say that these committees are the bone and sinew of the Association; that to them it owes its high standing among railroad activities; and that the president and officers of the Association wish to thank the committee members most sincerely for their continued effective work for our organization.

I should like, however, to speak of one special committee which was organized during the year to collaborate with a committee of the Railway accounting officers' Association regarding the pending reclassification of accounts being made by the Interstate Commerce Commission. The time has been too short to permit much progress toward the end in view, but the final results may confidently be expected to benefit the railroads.

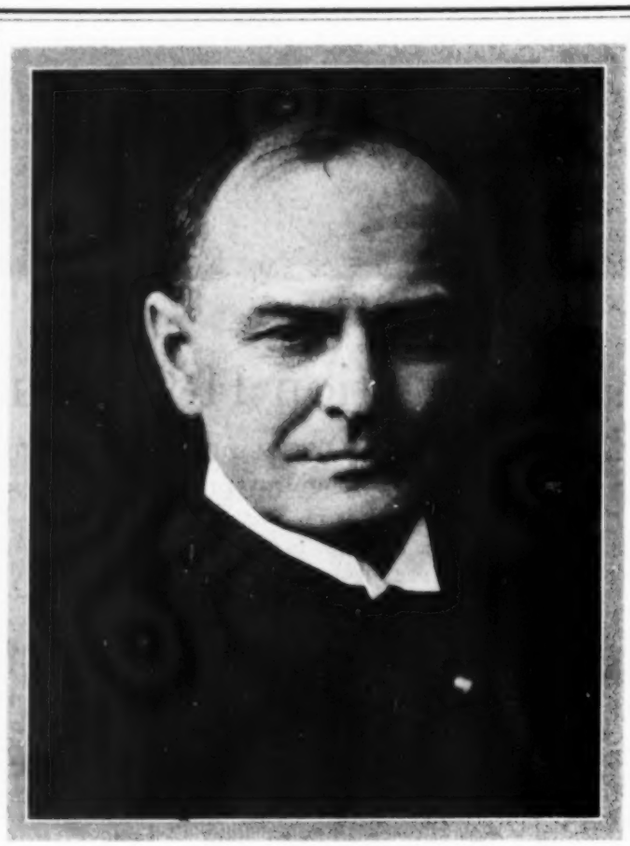
Railroad accounts are valuable as a record of past performance and existing status, but a more important element of their value is the use of these records as a basis for decisions as to future practice and performance. Necessarily these accounts are kept so as in a way to resemble a code. All railroad officers should have some general knowledge of railroad accounts. Many of the members of our Association have such a knowledge, but *every* member of the Association should make it his business to familiarize himself thoroughly with railroad accounting, both in principle and practice, in order to be able to decide for himself information constantly necessary.

Men of our training had a large part in the development of the railroads. It is hardly too much to say that, physically speaking, they created the railroads. They invented the locomotive and the tracks and roadbed upon which it runs. They likewise developed the multitude of structures and the many types of equipment that, taken together, make up the railroad as a unit. Long

before the birth of this Association they had constructed the network of railroads stretching from ocean to ocean on this continent. They aided in the effective organization of the railroads for operating purposes and had an influence upon establishment of the rate structure of the country's railroads, as witness the work done by those distinguished engineers, Albert Fink and his brothers. Brains and initiative come to the front in any line of endeavor, and we engineers have no monopoly of these qualities. Too many leading railroad men of today started as track men, office boys, engine wipers, clerks and telegraphers for us to doubt the statement. In fact, 25 years ago relatively few engineers occupied high official positions on the railroads.

Since then men of our training have tended to advance to the higher places in increasing numbers. But certainly it is a fact that the engineer even in his early position played a commanding part in the creation of the things that, taken together, make up the railroad systems of the country, and the railroad systems are the veins and arteries which keep the life blood of modern civilization in circulation. Some one has said that the old copy book maxim, "Knowledge Is Power," is a lie. But he was not thinking of real knowledge. He was thinking of information. Real knowledge, i. e., wisdom, is information combined with common sense, judgment and initiative, and it certainly is power. Moreover, education, not restricting the term to that of books or the schools, is much more than merely the acquisition of information. I like to think of our Association as a great continuation school, that coming after the university is engaged in a higher practical education, training its members not only to an understanding of the economics of construction, maintenance and operation, but also in the qualities that make for leadership, a friendly interest in and understanding of the other fellow—all growing out of a better acquaintance.

During the life of the Association, conditions have changed greatly. New and grave problems are confronting the railroads. For a time excessive regulation both of rates and of details of management limited the authority and initiative of the executives. Adverse labor conditions and a decline in the morale of the working force, coupled with the great advance in the cost of materials and supplies, have been largely the causes for the great increase in the cost of transportation and a source of great discouragement to railroad managements. Of these, the question of morale is possibly the one in which we as individuals can affect the situation most actively. Proper education of the right kind will show the worker that his own best interests are tied up with the best interests of his company and that a fair day's pay merits a fair day's work. On the other hand, the railroad officer must realize that his best interests are inseparable from the fair treatment of and the closer contact with his subordinates and that for every one of us, our advantage as well as our duty lies in fairness and friendliness to associates, loyal support of superiors, and a friendly and courteous attitude to the public, showing it at every opportunity how inseparably its interests are bound up in a reasonable prosperity for the railroads.



Edward H. Lee

President

Only 41 of the more than 2,000 members of the American Railway Engineering Association antedate Mr. Lee in his membership in this organization. He has been active in its work since his earliest connection, serving for 13 years as a member of the Committee on Uniform General Contract Forms, including five as chairman. As vice-president and chief engineer of the Chicago & Western Indiana he has given much time to the study of terminal problems and particularly to the handling of less-than-carload freight. At the present time he is giving much attention to the development of plans for a proposed passenger terminal.

Doubtlessly the regulation of rates and of some of the details of management are here to stay. Doubtlessly the labor question in one annoying form or another will persist, but the present situation is not without its encouraging side. The business men of the country are generally coming to see that their continued prosperity rests upon the prosperity of the railroads. The railroads are giving the public better service, in greater volume than ever before, and because of the steps which are being taken to bring the general public to a realization of the fact, public sentiment has become more favorable, and the Transportation Act is the result. Under it the railroads are enjoying greater prosperity than for years past. But every single member of this Association should be a publicity agent who leaves no stone unturned, when in contact with any one outside the railroad game, to affect his opinion favorably toward the railroads. We must never let up until the idea of sympathy for and co-operation with the railroads has been "sold" to everyone.

Our Association is undoubtedly coming to be the recognized authority upon questions of construction and maintenance, and upon some questions of operation. It

will continue to deal with the specific activities it was organized to handle, and with a continually increasing prestige that come from needed work well done. I think its members are also to do their share toward the solution of these grave problems of human contact and relationship, both because they have their share of brains and initiative freely available for the needs of the companies they serve, and because they well appreciate that the thoughtful study of these problems is a good preparation for the duties of the higher positions toward which many of them are advancing. If I may hand on a word of advice to our younger members, so full of brains and ambition and enthusiasm, I would be inclined to say, as every-day work, do the job in hand to the best of your ability; as special work, master railroad accounting in principle and practice; and as a general interest, study the psychology of your fellowmen. A large order perhaps, but upon your knowledge of and the usefulness of your mutual relations with those associated with you, both above and below, rests any success in official positions, or in efficient team work in any possible capacity.

Report of the Secretary

The twenty-fifth annual meeting of the American Railway Engineering Association is an occasion when it is especially fitting and proper to review the growth and the progress made during the past quarter-century, and to summarize briefly the elements which have contributed to its high reputation for efficiency and achievement.

Prior to the formation of the Association in 1899, few railways pursued the same methods or used the same appliances in the maintenance of way and structures department, even under similar climatic, physical and commercial conditions, and there was little approach to uniformity in that direction, except in so far as certain forms had, what may be termed a survival of the fittest, become "types."

It was the judgment of the founders that the best results would be attained through the medium of standing and special committees. The maintenance of way and structures department was therefore divided into 14 subdivisions, and a committee appointed for each division. Subsequent developments in the railway service appeared to make it desirable to increase the divisions to 25. The titles of the several committees are as follows:

STANDING COMMITTEES

I—Roadway.
II—Ballast.
III—Ties.
IV—Rail.
V—Track.
VI—Buildings.
VII—Wooden Bridges and Trestles.
VIII—Masonry.
IX—Signs, Fences and Crossings.
X—Signals and Interlocking.
XI—Records and Accounts.
XII—Rules and Organization.
XIII—Water Service.
XIV—Yards and Terminals.
XV—Iron and Steel Structures.
XVI—Economics of Railway Location.
XVII—Wood Preservation.
XVIII—Electricity.
XX—Uniform General Contract Forms.
XXI—Economics of Railway Operation.
XXII—Economics of Railway Labor.
XXIII—Shops and Locomotive Terminals.
XXIV—Co-operative Relations with Universities.

SPECIAL COMMITTEES

Stresses in Railroad Track. Standardization.

Committee work, as conducted in the American Railway Engineering Association, is unique, and constitutes the keystone of the organization, giving it life, vitality and effectiveness. The excellent reports presented to the association demonstrate the wisdom of adherence to a definite and consistent program. As a consequence, reports of the highest value are formulated, and the final action by the association results in the production of well-considered recommended practice.

Members of committees are selected with due regard as to their qualifications for handling certain subjects, in order that the work undertaken may be performed by experts in each particular line and, also, with due consideration to the diversity of conditions as regards climate and traffic in the different sections of the North American Continent.

Committee work yields its reward in numerous ways. It induces research and broadens the individual's viewpoint; it widens the member's acquaintance and promotes friendship; it affords contact with a most desirable class of men, and it yields opportunities for the enrichment of personal qualification and attainment.

The experience of the past 25 years has demonstrated the wisdom of the selection of a central point as a permanent meeting place and a definite time for holding the annual meetings of the Association. Upon careful consideration, the founders designated Chicago as the place and the middle of March as the time for the annual meetings. These annual gatherings, participated in by railway men from all sections of the American continent, afford exceptional opportunity for the interchange of views, experiences and observations pertinent to every-day problems, and are of unquestioned value. The annual meetings of the American Railway Engineering Association are characterized by intense attention to the business in hand, and no distractions are allowed to interfere with the three days' proceedings.

As an indication of the active participation by operating officers in the work of the association, it is interesting to note that three railroad presidents have served the organization as president; five vice-presidents of railroads and one general manager have held the same office. It is also of interest to record the fact that the membership rolls contain the names of 21 railroad presidents.

The annual volumes of the Proceedings almost fill a "five-foot-shelf," constituting an encyclopedia on subjects relating to maintenance of way and structures, as well as of operation, of incalculable value.

Owing to the importance and weight that should justly be attributed to the deliberate and carefully expressed opinions of an association comprising prominent railway officers and specialists in the various classes of work and duties connected with the location, construction, maintenance and operation of railways, and the influence that such a publication would undoubtedly have on railway engineering, maintenance and operation, special care was observed that only such matter be included in the "Manual" as had been carefully and sufficiently considered by the Association prior to its adoption at the annual conventions as to warrant its publication in this Manual as the practice recommended by the Association. The current edition is a volume of 1,000 pages.

Important original research work has been conducted by committees of the Association almost from its inception. Among the principal studies undertaken or still being carried on may be mentioned the impact tests on railway bridges; stresses in railroad track; injury to track and structures by brine drippings from refrigerator cars; tests of rail joints; marine piling investigations; steel rail investigations, etc.

During the period of federal control of railroads, it was deemed expedient to effect a working arrangement with the American Railway Association, whereby the American Railway Engineering Association performs the function of the Construction and Maintenance section and of the Electrical section of the Engineering division.

The effect of this arrangement is that the standing and special committees of the A.R.E.A. are also similar committees of the A.R.A. The completed work of committees is transmitted to the Board of Directors of the American Railway Association for endorsement, thus giving their work the backing of that association. In entering into this arrangement, the American Railway Engineering Association reserved the right to retain its corporate existence and to maintain its independence of action.

During the World War an important contribution of the Association consisted in furnishing the United States Government with 2,800 copies of the "Manual" for the use of the American Expeditionary Forces in France.

E. H. FRITCH, Secretary.

REPORT ON MEMBERSHIP

Membership as of March 1, 1923		2,010
Withdrawals during year	38	
Deceased members during year	13	
Dropped from rolls	42	
	93	
Additions during the year	232	
Net gain in membership		139
Total membership		2,149

Deceased Members: George W. Andrews, assistant to chief engineer maintenance, Baltimore & Ohio; H. R. Carpenter, assistant chief engineer, Missouri Pacific; Dr. P. H. Dudley, consulting engineer, New York Central Lines; W. F. H. Finke, tie and timber agent, Southern; J. E. Hood, general manager, Uintah railway; Robt. W. Hunt, consulting engineer; H. H. Johntz, engineer maintenance of way, Missouri-Kansas-Texas; J. W. Kendrick, chairman of board, International-Great Northern; L. L. Kerns, division engineer St. Louis-San Francisco; J. G. Legrand, bridge engineer, Canadian National; Baron Chuzo Mori, civil engineer, Japanese Government railways; R. B. Reasoner, division engineer, Oregon Short Line; J. G. Rodgers, vice-president, Pennsylvania.

FINANCIAL STATEMENT FOR CALENDAR YEAR ENDING DECEMBER 31, 1923

Balance on hand January 1, 1923 ..... $48,025.67

RECEIPTS

MEMBERSHIP ACCOUNT	
Entrance Fees	$ 1,240.00
Dues	10,212.49
Subscription to Bulletins	10,212.48
Binding Proceedings	1,604.71
Badges	15.00
SALE OF PUBLICATIONS	
Proceedings	2,399.97
Bulletins	1,406.14
Manual	9,109.86
Specifications	711.05
Leaflets	121.50
General Index	2.50
ADVERTISING	
Publications	960.40
INTEREST ACCOUNT	
Investments	1,726.07
Bank Balance	104.78
ANNUAL MEETING	
Sale of Dinner Tickets	961.00
MISCELLANEOUS	194.35
AMERICAN RAILWAY ASSOCIATION	
Rail Committee	6,890.96
Total	$47,873.26

DISBURSEMENTS

ORDINARY EXPENDITURES		
Salaries	$ 7,599.96	
Proceedings	4,029.05	
Bulletins	12,814.65	
Stationary and Printing	1,838.95	
Rents, Light, etc.	850.00	
Telegrams and Telephone	4.33	
Equipment	.....	
Supplies	128.51	
Expressage	801.32	
Postage	1,261.95	
Exchange	114.19	
Committee Expenses	67.63	
Officers' Expenses	60.57	
Annual Meeting	2,274.70	
Refund	34.00	
Audit	150.00	
Rail Committee	8,514.64	
Miscellaneous	212.85	
Total Ordinary Expenditures	$40,757.30	
EXTRAORDINARY EXPENDITURES		
Manual	10.915.25	
Grand Total	$51,672.55	
Excess of Disbursements over Receipts		$ 3,799.29
Balance on hand, December 31, 1923		$44,226.38
Consisting of:		
Bonds	$40,941.64	
Cash in Bank	3,259.74	
Petty Cash Fund	25.00	
	$44,226.38	

Report of the Treasurer

Balance on hand January 1, 1923		$48,025.67
Receipts during 1923	$47,873.26	
Paid out on audited vouchers, 1923	51,672.55	
Excess of Disbursements over Receipts		$ 3,799.29
Balance on hand December 31, 1923		$44,226.38
Consisting of:		
Bonds	$40,941.64	
Cash in Bank	3,259.74	
Petty Cash	25.00	
	$44,226.38	

STRESSES IN TRACK FUND

Balance on hand January 1, 1923	$ 940.70
Received from interest during 1923	28.61
Received from contributions	4,500.00
Total	$ 5,469.31
Paid out on audited vouchers during 1923	1,450.93
Balance on hand December 31, 1923	$ 4,018.38

GEO. H. BREMNER, Treasurer.

GENERAL BALANCE SHEET
DECEMBER 31, 1923

ASSETS	1923	1922
Due from Members	$ 3,322.75	$ 3,358.50
Due from Sale of Publications	2,345.04	1,078.94
Due from Advertising	3,800.00	1,865.00
Due from American Railway Association	2,908.93	1,275.25
Furniture and Fixtures (cost)	997.40	997.40
Gold Badges	61.00	68.00
Publications on hand (estimated)	6,000.00	6,000.00
Manual	5,000.00	9,575.75
Extensometers	500.00	500.00
Investments (cost)	40,941.64	40,794.14
Interest on investments (accrued)	776.63	580.05
Cash in Standard Trust & Savings Bank	3,259.74	7,206.53
Petty Cash Fund	25.00	25.00
Total	$69,938.13	$73,324.56
LIABILITIES		
Members' Dues paid in advance	$ 5,979.72	$ 4,832.50
Impact Test Fund on Electrified Railways	285.46	285.46
Advertising paid in advance	.....	70.00
Due for Printing (Bulletins)	1,272.49	1,314.69
Due for Printing (Manual)	.....	9,575.75
Surplus	62,400.46	57,246.16
Total	$69,938.13	$73,324.56

Report on Signals and Interlocking

THE COMMITTEE WAS ASKED to prepare a summary of the progress being made in automatic train control for the benefit of the members of this association who are not signalmen and who do not find it easy to keep up to date on this important subject.

The committee offered conclusions as follows:

"It is impractical to issue a report on train control which will be of value to our members, as such a report would be out of date before issued. Train control is changing so rapidly that a report several months old would be of little value. The Committee on Automatic Train Control of the American Railway Association is organized for the purpose of furnishing information on Automatic Train Control to railroads and officers interested, and that committee will give the information it has available, either on general subjects or on any specific subject.

Committee: F. B. Wiegand (N. Y. C.), chairman; W. M. Vandersluis (I. C.), vice-chairman; Azel Ames (Con. Engr.), H. S. Balliet (N. Y. C.), A. M. Burt (N. P.), C. E. Denny (N. Y. C. & St. L.), F. L. Dodgson (Gen. Ry. Sig. Co.), W. H. Elliott (N. Y. C.), G. E. Ellis (A. R. A.), H. K. Lowry (C. R. I. & P.), J. C. Mock (M. C.), J. A. Peabody (C. & N. W.), F. P. Patenall (B. & O.), A. H. Rudd (Penna.),

A. G. Shaver (Con. Engr.), Thos. S. Stevens (A. T. & S. F.), E. E. Worthing (Con. Engr.).

Discussion

F. B. Wiegand (Chairman): Chairman Coburn of the Outline of Work committee suggested that this committee prepare a summary on the progress being made in connection with automatic train control. Your committee was unable to prepare such a report and could only give reference to literature on the subject. *I move that the Progress Report be accepted as information.*

L. J. F. Hughes (C. R. I. & P): It seems to me that in an important subject like this, a great deal of knowledge could be given to the members of this Association by a report on automatic train control so written that members not actually signal men could obtain a working knowledge of this matter. Automatic train control is a very important subject and it has a great effect upon the maintenance of track, and I believe that the committee could profitably make a study and prepare a report for the benefit of this Association along the lines suggested.

Mr. Wiegand: From the information we have been able to obtain it would appear that the existing signals would require modification. The signals may have to be respaced. We may have to give three-block indications in order to provide the necessary breaking distances. What effect this may have on train operation the committee is not yet prepared to state, neither is the committee in a position to state whether or not train control will supplant fixed signals. We are not prepared to submit a report at this time.

J. R. W. Ambrose (Tor. Term.): I am not satisfied with this committee's report. There is no reason whatever why it couldn't give a progress report on train control. References to the proceedings of the Signal section A.R.A. are not of much use to our members. I would like to see this referred back to the committee for action.

Mr. Wiegand: The Committee on Automatic Control of the American Railway Association is organized for the purpose of furnishing information on automatic train control, and I am sure that if any of the members desire information the committee itself will be only too glad to furnish it.

T. S. Stevens (A. T. & S. F.): As a member of Committee 10 for a number of years I am not ready to endorse any report which is made to this association, giving fundamental principles or details of technique about automatic train control in any way.

President Lee: No doubt there is a great deal of uncertainty at the present time regarding even what may be considered later to be the fixed and basic principles that will govern. No doubt the signal men themselves are more or less uncertain, as Mr. Stevens pointed out, but there remains the fact that this great question must be considered with co-operation on the part of all if the interests of the railroads are to be properly conserved. It seems to me possible to prepare a brief preliminary survey of the question and we shall be very glad to have the chairman of the committee, keeping in mind the discussion that developed on this floor, reconsider the matter.

(The report of the committee was received as information and the subject of train control was referred back to the committee for further consideration.)

Report on Wooden Bridges and Trestles

Certain revisions of the specifications for workmanship in the construction of pile and frame trestles of untreated material under contract were submitted by the Committee on Wooden Bridges and Trestles for the Manual. A joint committee, which includes representatives of the A. R. E. A., the A. S. T. M. and the Central Committee on Lumber Standards is making an investigation to determine the criteria of the external appearance of timber by which some value may be assigned to it for design purposes. This joint committee has already recommended the separation of structural lumber into two classes, i. e., structural timber and heavy building material or yard lumber. A. O. Ridgway has been chairman of the committee for two years and a member since 1915.

Arthur O. Ridgway
Chairman

THE COMMITTEE recommended that the changes in the Manual (Appendix A) be adopted and that the reports appearing in Appendices B, C and E be accepted as information.

Committee: Arthur O. Ridgway (D. & R. G. W.), chairman; J. B. Maddock (C. of Ga.), vice-chairman; H. Austill (M. & O.), O. C. Badger (A. T. & S. F.), C. H. Blackman (L. & N.), W. E. Hawley (D. M. & N.), H. T. Hazen (C. N. R.), C. S. Heritage (K. C. S.), C. J. Hogue (West Coast Lumbermen's Assoc.), D. F. Holtman (Nat. Lumber Mfrs. Assoc.), W. H. Hoyt (D. M. & N.), T. F. Laist (Nat. Lumber Mfrs. Assoc.), C. E. Paul (Armour Inst. of Tech.), G. W. Rear (S. P.), D. W. Smith (H. V.), E. B. Hillegass (A. C. L.), G. C. Tuthill (M. C.), J. T. Vitt (Wabash), A. D. Warner (O. W. R. & N.), S. L. Wonson (M. P.)

Appendix A—Revision of Manual

It has been brought to the attention of your committee that there are a few paragraphs in the "Specifications for Workmanship for Pile and Frame Trestles of Untreated Material to be Built Under Contract," which are in conflict with or duplicate certain paragraphs in the "Uniform General Contract Forms."

As these specifications are to be used with the Uniform General Contract Forms, your committee recommends the following revisions in the above noted specifications:

Omit all of Paragraph No. 8 under "General Clauses," as the items covered by this paragraph are fully covered in Paragraph No. 13 of the Uniform General Contract Forms.

Omit all of Paragraph No. 9 under "General Clauses," except the first sentence, which will be retained. Paragraph No. 9 should now read: "Figures shown on the plans shall govern in preference to scale 'measurement.'" The other items in Paragraph No. 9 are covered by Paragraph No. 10 of Uniform General Contract Forms.

Omit all of Paragraph No. 11 under "General Clauses," as items covered here are fully covered by Paragraph No. 23 of Uniform General Contract Forms.

Omit all of Paragraph No. 28—"Time of Completion"—as this item is fully covered by the Form of Proposal and Agreement of Uniform General Contract Forms.

Omit all of Paragraph No. 29—"Payments"—which is fully covered by Paragraphs No. 36 and No. 38 of the Uniform General Contract Forms.

Appendix B—The Useful Strength of New, Old and Treated Timber When Used in Railway Trestles

To make a proper report on this subject it is desirable that real research work in an experimental and test way be done. Since the last convention of the association, very little additional information on the subject has been published or work completed.

There is in progress at the Forest Products Laboratory at Madison a program of four years for a series of column tests of full size specimens of 12-in. by 12-in. by 24-ft. West Coast fir and southern yellow pine. The laboratory staff is developing the application of the column formula to timber with some interesting conclusions.

Considerable study has been given to the grading of structural timber with reference to defects and the corresponding working stress values to be given to each grade. A search is being made to determine the criteria of the external appearance of timber by which some value may be assigned to it for design purposes. The Forest Products Laboratory has proposed such criteria in the form of Grading Rules and Working Stresses for Structural Timbers published in United States Department of Agricultural Circular No. 295.

To develop this phase the sub-committee is co-operating with a Sub-Committee of D-7 of the American Society for Testing Materials and a Sub-Committee of the Central Committee on Lumber Standards.

This Joint committee has returned a definite recommendation for the separation of structural lumber into two distinct classes, viz., structural timber (6-in. by 6-in. and over) and heavy building material, which latter would be classified as yard lumber. The committee, after thorough consideration of the matter favors this distinction or division of structural lumber into these two classes and has so advised the Joint committee.

Appendix C—The Classification of Uses of Timber and Lumber Under American Railway Engineering Association Specifications

This subject involves the practical application of the grading rules for lumber and timber to railroad uses of these materials. The whole subject of lumber grades is now being studied by the lumber business, and it is expected that definite revised commercial lumber grades will be formulated into final form in 1924. Until this phase of the work is completed, it appeared futile for the committee to apply any specific grades to any specific railroad use because such application cannot be made without many comparisons with old grading rules.

Appendix D—A System of Bridge and Trestle Inspection

This subject has already been considered and reported on by the Committee on Rules and Organization, and the rules and forms recommended by that committee have been included in the Manual. These rules give full instructions for the work of inspection, recording of notes and data, and the proper officer to who report should be made.

Appendix E—The Relative Merits of Open and Ballast Deck Trestles

The committee members have agreed unanimously that the ballast deck has many advantages over the open deck timber trestle. but desire to make a further study and investigation with the confidence that more facts may be presented either in support of or against our findings. The work thus far conducted leads to the conclusion that the ballast deck structure should be constructed of treated material, and that comparison with the open deck should be made on this basis.

Discussion

A. O. Ridgway (chairman): For the past few years there has been mixed with the work of this committee the general work of specifications, grading, classification rules of timber and lumber used for railway purposes. The work of the committee during the past year has been so necessarily intermingled with the movement now on foot for the simplification, grading and classification of lumber and timber that little progress has been made with these subjects. (Mr. Ridgway then briefly discussed the several sections of the report and *moved that they be adopted.*)

W. D. Faucette (S. A. L.): As the Chairman of the Committee on Uniform Contract Forms, I wish to say that we appreciate the recommendations of this Committee on Wooden Bridges and Trestles. We find in our work that there are certain conflicts and duplications in the committee work of other committees and ours, and we would like the chairmen of all the committees in the association who have in any of their work any clauses that duplicate or conflict with the contractural obligations existing between the railways and the contractor, to please take consideration of this in their studies and let the Committee on Uniform Contract Forms have that as a part of their work.

J. L. Campbell (E. P. & S. W.): I desire to refer back to the paragraph which the chairman of the committee read under Appendix D, and I desire to make this suggestion at this time as this question will probably arise again during the course of the convention in connection with the reports of other committees.

If a desirable system of bridge and trestle inspection, including the necessary report forms, is a proper subject for the consideration of this committee, probably it should be the primary consideration, and the recommendations of the Committee on Rules and Organization should be based upon such conclusions of this committee on this subject as may have been adopted by the association.

The rules and organization recommended by this association should rest more perhaps upon the recommended practice of the other standing committees adopted by the Association as recommended practice.

Mr. Ridgway: There are bridge inspection reports and rules already adopted by this Association. In our case, then, it would be rather in the nature of a revision of the Manual of the chapter devoted to rules and organizations. We didn't feel that that was quite within our province. We also found this, that probably nobody was using the recommended practice by the Rules and Organization committee.

Mr. Campbell: I am not attempting to criticize the report of this committee. I am in favor of the adopting of this report as it stands. The committee has given a good reason why it should be. We have certain rules and organization but I was endeavoring to discuss the subject

fundamentally and raising the question now that the members of the Association might be thinking about it and looking to future work rather than what has been done.

(The motion to adopt the report of the committee was carried.)

(The committee was excused with the thanks of the Association.)

Report of the Committee on Ballast

A vacuum ballast cleaning machine forms one of the newest developments in the use of mechanical equipment in the maintenance of way field and is described in the report of the Committee on Ballast. This machine has a 250-hp. steam turbine for a power unit and is expected to clean the ballast in one mile of single track per day of 10 hours. The committee presented some additions to the Manual which show the recomemnded practice in regard to the yardage of stone and gravel ballast per mile of track. It was felt unwise, owing to the lack of detailed data, to present definite and detailed rules for the handling of mechanical tampers, although certain recommendations were submitted. F. J. Stimson, chairman, has been on this committee for 18 years and chairman for the last three.

F. J. Stimson
Chairman

THE COMMITTEE recommended the following action on its report: 1. That the changes in the Manual, as shown in Appendix A, be approved and the revised version substituted for the present recommendation in the Manual.

2. That the matter presented in Appendix B, in regard to size of stone for ballast, be received as information.

3. That the recommendations in Appendix C, in regard to handling of mechanical tampers, be approved for publication in the Manual.

4. That the matter presented in Appendix D, in regard to ballast cleaning machines, be received as information.

5. That the matter presented in Appendix E, in regard to concrete foundations for crossings and tracks, be received as information.

Committee: F. J. Stimson (Penna.), Chairman; G. H. Harris (M. C.) Vice-Chairman; L. L. Adams (L. & N.), C. W. Baldridge (A. T. & S. F.), C. J. Coon (N. Y. C.), C. E. Dare (R. F. & P.), Paul Hamilton (C. C. C. & St. L.), K. Hanger (M. K. & T.), W. S. Hanley (St. L. & S. W.), A. G. Holt (C. M. & St. P.), C. B. Hoyt (N. Y. C. & St. L.), H. N. Huntsman (Wabash), S. A. Jordan (B. & O.), David McCooe (C. N. R.), M. J. McDonough (D. & H.), J. H. Reagan (G. T.), W. C. Reisner (C. & A.), Hans Schantl (M. R. & B. T.), H. C. Smith (P. R.), Paul Sterling (N. Y. N. H. & H.), D. W. Thrower (I. C.), P. H. Winchester (N. Y. C.)

Appendix A—Revision of Manual

Definitions

Attention was called to the fact that the term "shoulder" is defined in the Manual under the "roadway" definitions as having one meaning and under the "ballast" definitions as having another. It was the conclusion of the Committee on Ballast that to obviate all chance for confusion a prefix should be used, therefore. the committee recommend that the term *"Ballast* shoulder" be substituted for "shoulder" in the list of definitions and wherever it appears in the text.

Ballast Sections

Attention was called to the fact that it would be a great convenience to have shown with the various ballast sections, which have been adopted as recommended practice, the yardage required per mile of track. It is therefore recommended that there be added to the diagrams appearing in the Manual the following:

Stone Ballast

Single Track

Sub-ballast	2,664 cu. yd.
Top-ballast	3,995 cu. yd.

Double Track

Sub-ballast	5,206 cu. yd.
Top-ballast	7,320 cu. yd.

NOTE: Allow for shrinkage between measurements in car in pit and quantity required to bring track originally standard section:

For sub-ballast, 8 per cent to 20 per cent.
For top-ballast, 12 per cent to 15 per cent.

Gravel Ballast

Single Track

Sub-ballast	4,726 cu. yd.
Top-ballast	4,144 cu. yd.

Double Track

Sub-ballast	7,268 cu. yd.
Top-ballast	7,626 cu. yd.

NOTE: Allow for shrinkage between measurements in the car and quantity required to bring track originally standard section for both top and sub-ballast from 8 per cent to 20 per cent.

Appendix B—Size of Stone for Ballast

There seems to be considerable sentiment favoring the use of a smaller size stone if the material is hard trap rock or granite than if softer, like limestone. There also is sentiment favoring the use of a larger stone where the character of traffic is such that the aim is to maintain a track for extremely heavy freight traffic but with the comparatively slow and unimportant passenger traffic.

Appendix C—Mechanical Tampers, Methods of Use and Handling

In the committee's judgment, the promulgation of definite, detailed rules covering the handling of these machines is unwise at the present time, due to insufficient

data on the subject, but for a certain class of work definite recommendation may be made.

Use of Mechanical Tampers

Where track is being lifted from one to three inches, out of face, and on stone:

1. For use as an individual section tool, use a two-tool pneumatic or a two-tool electric tamper; the former with a power plant integral with a motor car, and the latter with a four-tool capacity power plant of the separate type on skids: the section force necessary to operate consisting of a section foreman and from six to nine men, depending on the type of machine used and the frequency of tie renewals.

2. For use as an alternate two-section tool, use a four-tool pneumatic or a four-tool electric tamper; the former with a power plant integral with a motor car, and the latter of the separate type on skids: the section force on each section consisting of a section foreman and from six to nine men, of which combined force (depending on the type of machine used) 8 to 10 men should be used with the tamping machine, when it is used as a four-tool machine.

3. For use as a floating individual unit working over several sections, use a four-tool pneumatic or a four-tool electric tamper, both with power plant integral with a motor car. The regular force assigned to this outfit to consist of one experienced mechanical tamper foreman and from five to eight men assisted by the regular section force, depending on the type of machine used.

4. For use in batteries of two or more tamper units working as an extra or floating gang over extensive stretches of track, use four-tool outfits, either pneumatic or electric, each unit to be manned by a force consisting of from six to nine men, depending on the type of machine used, together with whatever additional force the nature of the work requires.

Appendix D—Cleaning Ballast by Hand and With Machines

Descriptions of various ballast cleaning machines have appeared in the Proceedings of the A.R.E.A. from time to time. However, a ballast cleaner on a new principle is being developed on the Pennsylvaina System and through the kindness of W. G. Coughlin, chief engineer maintenance of way, Eastern Region, a description of the device is presented as information:

Vacuum Ballast Cleaning Machine

"This machine will consist of a 250 hp. steam turbine, connected to a rotor. The rotor will exhaust the air from a large expansion chamber creating a partial vacuum. The entire machine will be mounted on a flat car, built specially for this purpose. At the end of the car three telescoping 8-in. pipes will extend downward to the ballast level, the upper ends of the pipes entering the expansion chamber.

"The machine will be drawn by a locomotive, which will also furnish steam at 250 lb. pressure to the steam turbine. In operation the locomotive will uncouple from the ballast cleaner and advance 12 ft. It will then act as an anchor while an auxiliary steam engine mounted on the ballast cleaner will pull the cleaner to the locomotive by a chain, after which the locomotive will advance another 12 ft. This is done to secure a more uniform movement. The steam connection between locomotive and ballast cleaner is maintained through flexible steam line with "Barco" angle joint connections.

"The three telescoping inlet pipes at end of car operate one between the rails and one outside each rail; all three automatically move laterally as the car moves forward. They also telescope automatically with the lateral movement, in order to allow the end of pipe to be in a horizontal plane. The center pipe will travel from rail to rail and the outside pipes will reach to a point 2 ft. 3 in. from end of tie.

"It is expected to lift ballast and dirt through the three inlet pipes. The dirt will be screened out in the expansion chamber and will be deposited in a temporary storage chamber, from which it is removed at intervals, while the stone will pass through a discharge valve which operates similar to a revolving door, letting the ballast out but not allowing air to enter. This will return the ballast to the track at a point less than 15 ft. from where it was taken out.

"The machine is being built by the Pneumatic Conveyor Company of Philadelphia, and is expected to clean one mile of single track per day of 10 hours."

Appendix E—Concrete Foundations for Crossings and Tracks

An examination was made of information on this subject, obtained by the various committees in former years as published in bulletins of the A.R.E.A. Especially Bulletin 214—December, 1919, which showed quite a complete review of work of this character done up to that time.

It would appear than any installation of this kind is very expensive and is only to be resorted to where the subgrade is soft and puddles easily, enveloping the ballast, thus allowing the track surface to become distorted. and where a greater bearing surface is required on the subgrade than the ties will furnish. An example of such an installation is the concrete slab work now in process of construction in the yard of the Chicago Union Station. This work was described in an article by Joshua D'Esposito, chief engineer of that company, published in Railway Engineering and Maintenance for September, 1923.

Discussion

(The report was presented by Chairman Stimson, who first submitted the committee's recommendation as to a revision of the Manual's definition for "shoulder." *This revision was adopted.*)

Chairman Stimson: The attention of the committee has been called to an apparent discrepancy between the shrinkage allowance shown in the recommendations concerning ballast sections and the experience of railroads generally as evidenced by information obtained in records of ballast actually used. Information secured since the report was prepared has caused the committee to make certain changes in the percentages and add an explanation of the application of the revised shrinkage figures. This, we believe, will eliminate the apparent discrepancy to which reference has been made. The preface to proceed the recommendation is as follows:

"The shrinkage that the committee recommends is the percentage which must be added to the yardage as shown by measurements in cars at the pit, in order to equal the yardage essential to bring the track to the elevation required by the ballast sections which have been adopted by the A.R.E.A. as recommended practice. This does not, in any sense, take into account the settlement which will take place during a considerable period of time under traffic. To bring the track back to its original elevation after such settlement will require additional ballast.

"As a finished top of rail elevation is usually fixed, in many locations at least, the quantities and shinkages named by the committee and dressed in accordance to the standard section when it first leaves the hands of the

lifting and surfacing gang, do not take into account future requirements to keep the tracks at the established elevation."

(The motion made to adopt the recommendations was carried.)

(Chairman Stimson then submitted the committee's report of progress on the size of stone for ballast which was accepted for information. In the absence of G. H. Harris (M. C.), chairman of the sub-committee on mechanical tampers, Mr. Stimson submitted the report and *moved it be adopted as recommended practice. (Motion carried.)* The report of the committee on cleaning ballast, Appendix D, and on concrete foundations for crossings and tracks, Appendix E, were thereupon submitted and eccepted as information. The committee was then excused with the thanks of the association.)

Report of Committee on Ties

One of the regular features of the report of the Committee on Ties is a progress report on substitute ties which this year included a tabulated summary of the results to date. Considerable information collected on the subject of ties of foreign woods indicates that the experience of the roads with these woods has not been satisfactory. A detailed report was presented on the dimensions of ties, showing the changes which have taken place since 1905. A comparison with sizes of that year shows the present widespread use of 7-in. by 7-in. by 8-ft. 6-in. ties as compared with 6-in. by 8-in. by 8-ft. ties, most widely used in 1905. W. A. Clark has been chairman of the Committee on Ties for the last three years and is now completing his eleventh year on the committee.

W. A. Clark
Chairman

IN APPENDIX A, THE COMMITTEE submitted its usual report on substitute cross-ties with a tabulation showing the various installations where tests of ties are now in progress and the status of the tests up-to-date.

The committee also presented a report in Appendix B on the dimensions of ties, with the recommendation that paragraphs 2, 3 and 4 of the conclusions be approved for publication in the Manual. The committee made a progress report on the subject of ties of foreign woods in this country. A large amount of information has been collected which will probably be published in a summer bulletin. The information to date shows that the experience with foreign woods in this country has not been satisfactory.

Committee: W. A. Clark (D. & I. R.), chairman; W. J. Burton (M. P.), vice-chairman; B. F. Beckman (F. S. & W.), R. S. Belcher (A. T. & S. F.), H. C. Bell (N. & W.), M. S. Blaiklow (Can. Nat.), Bernard Blum (N. P.), H. A. Cassil (P. M.), William Champagne (E. P. & S. W.), E. L. Crugar (I. C.), J. F. Diemling (M. C.), W. T. Evans (C. & A.), S. B. Fisher (M. K. & T.), John Foley (Penna.), G. F. Hand (N. Y. N. H. & H.), H. C. Hayes (I. C.), R. M. Leeds (L. & N.), A. F. Maischaider (C. C. C. & St. L.), H. W. McLeod (C. P. R.), A. J. Neafie (D. L. & W.), G. P. Palmer (B. & O.), L. J. Riegler (Penna.), J. H. Roach (N. Y. C.), S. E. Shoup (K. C. S.), C. U. Smith (C. M, & St. P.), J. W. Williams (W. P.), W. W. Wysor (U. R. & E.), R. C. Young (L. S. & I.).

Appendix B—Dimensions of Ties

The subject of dimensions of ties was re-assigned to the committee. In order to bring the information on current practice up-to-date and to have the benefit of the work of the Committee on Stresses in Track the committee sent out a questionnaire requesting certain information as to present practice. These replies were tabulated in a series of tables.

Table 1 showed the number of roads and single track mileage reporting, separated between main track in main lines, main track in branch lines, and yards, sidings and sidetracks. The separation between main lines and branch lines is in accordance with the common practice of each road.

Table 2 showed the use of ties of the different grades in main track in main line. Grade 5 ties (7 in. by 9 in.) are most widely used, being in use by 67 per cent. of the roads and 78 per cent. of the mileage reporting. Only one road reported grade 6 ties (7 in. by 10 in.).

Table 3 showed the use of ties of the different grades in main track in branch lines. Grade 3 ties (6 in. by 8 in.) are most widely used, being in use by 55 per cent. of the roads and 67 per cent. of the mileage reporting.

Table 4 showed the use of ties of the different grades in yards, sidings and sidetracks. Grade 3 ties (6 in. by 8 in.) are most widely used, being in use by 56 per cent. of the roads and 69 per cent. of the mileage reporting. Grades 1 to 5 are in general use in yards, sidings and sidetracks, the use of smaller sizes being confined to a very few roads.

Table 5 showed the use of ties of different lengths. The 8-ft. tie is most widely used in all three classes of track. However, in main lines, Grade 5 ties (7 in. by 9 in.) are most widely used in the 8 in.-6 in. length.

Tables 6, 7 and 8 showed the grade, length and spacing of ties in the three classes of track reported. In general, there is no relation between the width of the tie and the number per 33-ft. rail. The most widely used spacing is from 18 to 20 ties per 33-ft. rail in main lines and branch lines and the 16 to 18 ties per 33-ft. rail in yards, sidings and sidetracks.

Table 9 contains the recommendations for thicker, wider or longer ties, closer spacing or other woods, for use under the heaviest traffic (main track in main line). Only 31 of the 92 roads reporting recommended changes in their present practice. Twenty-five of these recommended larger ties or closer spacing. In general, the recommendations are for 7 in. by 9 in. by 8 ft.-6 ft. ties

spaced 20 per 33-ft. rail. One road recommended a tie 8 in. thick and one road a tie 9 ft. long. Ten roads recommended other woods; all of them are now using untreated woods and all except one recommended treated woods.

Table 10 showed how much of tie either side of rail is tamped. The general practice is to tamp from 16 in. to 24 in. inside of the rail and 16 in. to end of tie outside of the rail.

Table 11 showed the experience of the different roads as to the least practicable space between faces of adjoining ties to permit proper tamping. The largest number of roads and the largest mileage consider 10 in. as the minimum space between ties for proper hand tamping, and 8 in. as the minimum for machine tamping.

Table 12 showed the bearing area on the ballast and per cent. of rail length supported with various combinations of width, length, and number of ties per 33 in. rail based on a tamping space between ties of about 10 in. indicated in Table 11 as the proper minimum for hand tamping. The present practice of the roads was also shown; attention was called to the greater bearing area on ballast which can be obtained by use of wider ties.

The answers to the questionnaire show the general use of the A.R.E.A. grades 1 to 5, inclusive. Only one road reported use of grade 6 ties (7 in. by 10 in). Replies to the questionnaire also show there is no relation between size of tie and kind of ballast and that practically all of the grades of ties are used in each of the A, B and C classifications of track (1921 Manual, page 16). Comparison with sizes reported in 1905 shows the present wide use of 7 in. by 9 in. by 8 ft.-6 in. ties as compared with 6 in. by 8 in. by 8 ft. ties most widely used in 1905. The spacing at the present time is closer, 18 to 20 ties per 33 ft. rail being most widely used in main track, as compared with 16 ties per 30 ft. rail in 1905. This is in line with the necessity for a stronger track structure to carry the largely increased wheel loads.

Conference has been had with the chairman of the Committee on Stresses in Railroad Track to determine what conclusions regarding dimensions of ties can be drawn from the work of that committee. The following interpretation of the work of the Committee on Stresses is a combination of definite findings and opinions drawn from contact with the field work. These may be set down as follows:

1. It is not considered proper or possible to design a tie in the sense that a bridge member is designed.

2. In making use of actual stress figures, allowance must be made for the average condition of the timber in the track instead of using the various physical properties for new timber. This means that consideration must be given to the strength of the timber—

(a) When new.
(b) When cut into.
(c) When decayed.

Data on strength of the timber under conditions (b) and (c) is non-existent.

3. The variations in track conditions are very considerable. The track tested by the stresses committee has in most cases been very good track and probably the tests do not indicate the extreme conditions to which ties may be subjected where ballast and maintenance conditions are not so good.

4. The work of the stresses committee has clearly indicated that the tie, even in the very best of track, acts very largely as a beam instead of as a mere block or holding device. This, of course, points to the desirability of increasing its stiffness as a beam which varies as the cube of the depth. The usual depression of the tie at the rail under the heaviest load is about 0.3 in. net in addition to an initial play of about 0.1 in. This depression of the tie is the cause of the formation of depressions in the ballast bed at points along the length of the tie and these depressions materially increase the bending moment developed in the tie. The tie should be designed to keep the deflection at a minimum under usual conditions of track and load. It is believed that the results as indicated in the progress reports of the Committee on Stresses justify the 7 in. thick tie as against the 6 in. thick tie.

5. The results of the stresses committee's work show the kink in the flexure curve under the rail due to the weakening of the tie at the fastenings, which is the point where the greatest strength is required. The results of the committee's work can be used as reason for any steps taken to lessen the weakening effect of the rail fastenings.

Tests of Substitute Ties Now in Progress

Railroad	Name of Tie	Location	Date Put in Track	Number Put in Track	Number Now in Track
B. & O.	Metal Tie Co.	Martinsburg, W.Va.	May 1909	50	No report
	Wyckoff	Baltimore, Md.	Dec. 1920	4	4
B. & L. E.	Carnegie	Various	Jan. 1905	Many	Many
C. C. C. & St. L.	Carnegie	Greensburg, Ind.	Spring-1906	3000	2971
D. L. & W.	Hardman	East Dover, N. J.	Dec. 1918	30	Few
D. T. & I.	Indestructible		May 1923	50	50
D. & I. R.	Carnegie	Various	1905	2000	1105
	Hatch	Two Harbors	Aug. 1923	11	11
D. M. & N.	Carnegie	Duluth & Proctor	1908-1909	22380	21865
	Kimball (Steel)	Virginia, Minn.	1914	30	30
E. J. & E.	Bates	Whiting	May 1912	62	62
	Carnegie	Various	Various	15509	9832
	Carnegie Switch	Various	1912, Later	518162 l.f.	384589 l.f.
K. C. S.	Ickes	Kansas City	1921	27	None
	Ickes	Kansas City	1922	27	27
L. E. & W.	Buhrer Concrete	Tipton, Indiana	Aug. 1903	5	5
Long Island	Carnegie	Hicksville, N. Y.	May 1909	30	Few
Los Angeles	McDonald	Los Angeles, Cal.	July 1911	4323	No report
N. & P. Belt	Am. Conc. Tie	Portsmouth, Va.	June 1919	18	18
Pennsylvania					
Eastern Reg.	Champion	Lenover, Pa.	June 1920	995	767
Western Reg.	Riegler	Emsworth, Pa.	May 1908	15	15
	Snyder	Derry Yard	Oct. 1907	821	683
		Conemaugh Yard.	Oct. 1907	1600	1030
	Metal Safety	Wampum, Pa.	Nov. 1922	20	20
P. M.	Kimball	Bay City, Mich.	1902	*	*
P. & L. E.	Atwood	McKees Rocks, Pa.	Oct. 1908	5	5
	Standard	Classport, Pa.	May 1914	20	20
P. S. & N.	Carnegie	Bryndale Branch	Summer 1907	795	48
R. R. & P.	Wolf	Riverside, Cal.	Oct. 1913	60	No report
S. P.	Goodlett	Oakland, Cal.	Nov. 1917	27	No report
S. P.	Indestructible	Eagle Pass, Texas	May 1916	23	23
Ter. R. R. of St. L.	Chamberlain	St. Louis, Mo.	April 1920	10	10
W. & L. E.	Munslow	Jewett, Ohio	Nov. 1916	27	No report

*3400 lin. ft. of track.

6. In determining the proper width of tie, the following points should be considered:

(a) To support the load.
(b) To hold the ballast and keep the maximum pressure at the middle of the width down to a permissible value.
(c) Upper limit of width to allow effective tamping.

Theoretically, at least, a tie can be made wide enough so it will split by reason of the concentration of pressure at the middle of its width. In regard to tamping, it is thought that this is not a matter of test, but a matter of track maintenance and that a width of 10 in. on 12 in. is the upper limit.

7. As regards the length of the tie, the tests contained

in the second progress report of the Committee on Stresses indicate that an 8-ft. tie is not long enough to properly distribute the load outside of the rail. The first 4 in. from the ends of the tie are ineffective in developing load, although it is necessary to have the 4 in. as a means of confining the ballast sufficiently to build up the load. This same effect is in a measure produced by a heavy, full shoulder, but it is thought that the outer 4 in. of each end of the tie cannot be considered in determining the effective reaction. It is the opinion, based on tests, that a tie must be at least 8 ft. 6 in. long to distribute the load properly and probably the length should be 9 ft. The use of canted tie plates and eccentric tie plates, as well as wider rail bases, have all tended to necessitate longer ties.

Conclusions

1. The size of ties most widely used under heavy traffic (main track in main lines) has increased since 1905 from 6 in. by 8 in. by 8 ft. to 7 in. by 9 in. by 8 ft. 6 in.

2. Owing to the many variables involved, including strength of timber in its average condition in track, condition of road bed, etc., it is not possible to calculate a design for a tie in the sense that a bridge member is designed.

3. For heavy traffic, ties should have a minimum thickness of 7 in., a maximum width of 12 in. and a length of at least 8 ft. 6 in. or possibly 9 ft.

4. A space of 10 in. between tops of ties allows sufficient room for tamping; the maximum of bearing area on the ballast may be secured by use of the wider and longer ties laid with this spacing.

Discussion

(W. A. Clark (chairman) presented the report and introduced W. J. Burton (vice-chairman), who took up the subject of substitute ties.)

Mr. Burton (M. P.): The committee this year has prepared some designs but is not yet ready to report to the Association. This preliminary work includes the obtaining of competent legal advice as regards the patent situation and the actual preparation of design. We hope next year to submit some designs which may be tried out.

In going into this work the committee has in mind the fact that in the past, designs of substitute ties have very largely originated with inventors or others who as a rule have known very little about the requirements. The committee feels that it might perform a useful service if it were to take the lead and attempt to design ties which would overcome the points which have caused failure in past efforts.

(G. F. Hand (N. Y., N. H. & H.) presented the report on dimensions of ties. He outlined briefly the contents of this part of the report, particularly with reference to the information obtained from the railroads through a questionnaire.)

Mr. Hand: One important thing to notice is that the answers to the questionnaire show the general use of the A.R.E.A. grades one to five inclusive. Comparison with sizes reported in the 1905 report shows the present wide use of 7-in. by 9-in. by 8½-ft. ties as compared with 6-in. by 8-in. by 8-ft. ties most widely used in 1905. The spacing at the present time is closer, 18 to 20 ties per 33-ft. rail being most widely used in main track, as compared with 16 ties per 30-ft. rail in 1905. This is in line with the necessity for a stronger track structure to carry the largely increased wheel loads. (Mr. Hand read the findings and opinions numbers 1 to 7, inclusive, following which Mr. Clark asked that conclusions 2, 3 and 4 be adopted.)

President Lee: Conclusion No. 2; are there any remarks?

Conclusion No. 3?

Conclusion No. 4?

Maurice Coburn (Penna.): It seems to me that spacing is a function of the depth of the tie, and that a good many people do not agree that 10-in. is sufficient with a Grade 5 tie which frequently is over 10 in.

E. R. Lewis (M. C.): It seems to me that a width of 10-in. is a function of the width of the ballast shovel. It doesn't matter whether you hand tamp or machine tamp, you work the ballast with the ballast shovel and I think they are about 10-in. wide.

W. H. Kirkbride (S. P.): Even though you do not turn the shovel to tamp the tie, you must clean out the pockets between ties. There certainly should be room enough left to work the shovel.

J. L. Campbell (E. P. & S. W.): According to the recommendation of the committee on ballast, the spacing of the tie should be a function of the depth of the ballast and I am rather inclined to think that it might be a mistake to specify one spacing of a tie only. If any railroad is putting in ballast according to the recommendation of the Association, it might very well be that the spacing could be a little more than 10 in.

Mr. Lewis: My thought is this: No matter what spacing you make them, or what you intend to make, you don't get it when the ties are put in. It does not seem to me that it makes a very great deal of difference, except in the ordering of the number of ties per mile track.

Mr. Clark: As I understand it, this conclusion is largely for the benefit of the road that is attempting to get the greatest possible support for the track, and a large majority of the replies indicate that 10-in. is sufficient spacing to allow tamping. They can then decide on the width of tie they wish to use to get the maximum support. I don't think it was the committee's intention that every road would adopt a 10-in. spacing. It was merely suggested as a minimum.

Mr. Burton: In regard to conclusion 3, we feel that the preponderance of practice is not necessarily an indication of the best practice. One of the most important facts that the work of the Stresses in Track committee has brought out, is that the outer four inches at each end of the tie is ineffective in developing the load. That loss of four inches, coupled with the pushing out towards the end of the tie of the center of pressure, due to the wider rails, etc., results in a considerable unbalanced loading on the tie. It is the thought of the committee that it is an advance in the art, due to the investigations of stresses, to point out that the eight-foot tie is not long enough.

E. A. Frink (S. A. L.): The committee said in the beginning, I believe, that it was not possible to design a tie theoretically. It seems to me that is an eminently practical decision.

Nevertheless, the length of that tie seems to depend somewhat on theoretical considerations, and for this reason, the tie settles in the track through the impact it receives. That impact is greatest where it receives the least amount of cushioning right under the rail. The impact is transferred to the ballast directly through the tie, with no cushioning except the elasticity of the wood in compression. As you get away from the rail toward the outer end, for instance, it gets the additional cushioning due to the elasticity of the tie as a beam; in other words, wood tends to spring. That means that the ballast is depressed less towards the end of the tie than it is directly under the rail. Therefore, you would soon approach a point where the tie would not be strong enough, as a beam, to transmit its load.

It is not probable that a 9-ft. tie will cost very much

more than an 8½-ft. tie and if we will get a better track by using a 9-ft. tie, then it seems to me we can all afford to go to it, but we want to be pretty sure that we are going to get a better track before we adopt a recommendation of this kind.

President Lee: Is there any further discussion? *I will ask the Association to vote on Recommendation 5.*

(*The recommendation was accepted.*)

Mr. Lewis: *I move the elimination of Conclusion 4.*

Mr. Hand: I believe there is a misconception of that as indicated by some of the remarks on the floor. The conclusion as it reads is absolutely in accordance with the practice reported in the conference. "A space of 10 in. between tops of ties allows sufficient room for tamping." It is not proposed to put down as a standard, that all ties should be laid in a spacing of 10 in. at the tops.

Mr. Campbell: On the whole I think that this statement of the committee is right. It is a fact that 10 in. is enough room to get the shovel in, and I am in favor of getting all of the timber under the rail that you can get. When you put 20 7 by 9 ties to a 33-ft. rail, 10 in. is about all you have left.

(*The motion was lost.*)

President Lee: *The motion now is for the adoption of Recommendation 4.*

(*The motion was carried* and the committee was discharged with the thanks of the Association.)

Report on Uniform General Contract Forms

The Committee on Uniform General Contract Forms submitted a number of forms of agreement covering such relations as trackage rights, joint use of passenger and freight facilities and the placing of snow or sand fences beyond a railway company's property line. This committee, through its chairman, has participated in the Joint Conference on Standard Construction Contracts. One of the vital questions which is involved is the matter of arbitration. It was felt that at some future day the Association will be called upon to consider some form of standard construction contract in lieu of the form now published in the Manual. W. D. Faucette has been chairman of the Committee on Uniform General Contract Forms for four years and has also served as a member for eight years.

W. D. Faucette
Chairman

In appendix A, the committee recommended for final adoption by the Association (a) form of agreement for trackage rights; and (b) that title of "Form of License for Wires, Pipes, Conduits and Drains on Railway Property," which was submitted by this committee and adopted at the 1922 convention, be changed to read "Form of License for Wires, Pipes, Conduits, Drains, Hopper Pits and other Structures on Railway Property." Appendix B is a progress report of the work of the agreement for joint use of passenger and freight facilities, with particular reference to the form of agreement for joint use of passenger facilities submitted for criticism and suggestions. No recommendations were submitted for changes in the Manual.

In Appendix C is a report submitted for adoption on a form of agreement for placing snow or sand fences beyond the railway company's property line, and for information and discussion, on a form of option for purchase of land, and a form of agreement for purchase of electrical energy.

In connection with the representation by the chairman of this committee as a delegate to the Joint Conference on Standard Construction Contracts, some informal conferences have been held on this subject, at which time your representative attempted to reflect as far as possible the Association's attitude on many of the questions that arose in this joint conference debate.

One of the vital questions involved is the matter of arbitration. The question arises as to how far and in what manner the Association may consider any form of arbitration in its uniform general construction contract form as printed in the Manual. Acting on a letter of instructions from the Board of Direction, outlining some of the views of the board on this subject of arbitration, your chairman has presented those views to the joint conference as clearly as possible. Briefly, it was the opinion of the Board of Direction that limited arbitration might be considered on certain points arising in construction matters, but the views of the board were not such as to indicate that the board would attempt to bind the Association in any wise without vote by the Association on this very important question. Neither has there been any action on the part of your delegate which would commit the policy of the Association to unlimited arbitration on the decisions of chief engineer in lieu of the chief engineer's right of direction, as now set forth in the form printed in the Manual, and which is generally used in railway practice in this country.

The form of limited arbitration submitted to the joint conference by your delegate touched upon the following three factors, which this Association might consider as subjects fit for arbitration. They were: (a) Classification of material not clearly covered by contract; (b) Delays arising not the fault of contractor; (c) Changes order not clearly covered within the terms of the contract.

At some future day this Association will be called upon to consider some form of standard construction contract to be considered or adopted in lieu of the form now published in the Manual, which form represents the collective thought and approval of this Association. The Association's representatives have explained to this joint

conference, as clearly as possible, on the several paragraphs involved, the railways' practice and viewpoint, but as there are many other members of this joint conference who are not directly interested in railway practice, it cannot be assumed that any final draft evolved by this joint conference will entirely represent the railway viewpoint of this Association.

Committee: W. D. Faucette (S. A. L.), chairman; J. C. Irwin (B. & A.), vice-chairman; C. Frank Allen, F. D. Anthony (D. & H.), Col. Wm. G. Atwood (Nat'l Research Council), W. H. Brameld (Erie), J. B. Carothers (B. & O.), Clark Dillenbeck (P. & R.), W. A. Duff (C. N. R.), E. M. Durham, Jr. (U. S. R. A.), C. A. Wilson (A. C. L.), F. H. Fechtig (A. C. L.), B. Herman (Sou.), O. K. Morgan (C. C. & O.), F. L. Nicholson (N. S.), C. B. Niehaus (C. of G.), H. A. Palmer (C. N. R.), A. C. Shields (D. & R. G. W.), E. L. Taylor (N. Y., N. H. & H.)

Appendix A—Form of Agreement for Trackage Rights

THIS AGREEMENT, made this....day of.....19..., by and between.....(Corporate name of Grantor)..... a corporation organized and existing under the laws of the State of....., Hereinafter called the .....(Condensed name of Grantor)..... and ....(Corporate name of Grantee)....a corporation organized and existing under the laws of the State of....., hereinafter called the....(Condensed name of Grantee).... Witnesseth:

Whereas the.....(Grantor).....owns or operates a certain portion of the railway, extending

(Description)

and

Whereas the.....(Grantee).....wishes to acquire the right to use the same and the....(Grantor).... is willing to grant such use.

Now Therefore, in consideration of the premises and of the mutual conditions and agreements hereinafter set forth, the parties hereto covenant and agree as follows:

Grant.—1. The.....(Grantor)..... hereby grants to the.....(Grantee)..... and the.....(Grantee).....agrees to exercise during the term and subject to the provisions of this agreement, the right to use jointly with the.....(Grantor)..... and any other parties to whom the.....(Grantor)..... may grant similar right, the.....(Grantor's)..... railway between.....and..... a distance agreed upon for the purposes of this agreement as .....(....) miles and the rights to move therover its own through trains, hauled by its own motive power.

Description.—2. The facilities covered by this agreement are herein referred to as the "joint section." A schedule thereof as of the effective date of this agreement, together with the values agreed upon for the purposes of this agreement only, is attached hereto, marked Schedule..... .....and is hereby made a part hereof.

The tracks included in said joint section are shown in red lines on the map marked:

.....
.....

which is hereto attached and hereby made a part of this agreement.

The joint use hereby granted shall include the property and appurtenances which the.....(Grantor)..... may at his option find necessary to construct and maintain for the safe and prompt passage of trains over the joint section during the life of this agreement.

Connections.—3. The....(Grantee)....shall, at its own expense, construct the necessary connections between its tracks and the tracks of the....(Grantor)....at....., and shall thereafter properly maintain and operate the same at its own expense, and shall indemnify, protect and save harmless the.....(Grantor)..... its successors and assigns, from all loss or damage which they or any of them may suffer or become liable for, on account of, or growing out of, the construction, maintenance or operation of said connection. Any switch connections in the track of the.....(Grantor)..... shall be constructed and maintained by the....(Grantor).... at the expense of the.....(Grantee).....

Changes in Interlocking.—4. If it shall be found necessary to install any interlocking plant, signal device or other safety appliances, or make changes in any existing interlocking plant, signal device or other safety appliances resulting from any and all of said connections between the tracks of the parties hereto, such extensions shall be made and the expense shall be borne on the following basis:

Conditions of Use.—5. The right of use hereby granted to the.....(Grantee)..... is the right to run trains manned by the employes of the .....(Grantee).....over the joint section, but not to do any local freight, passenger or express business within the limits of said joint section.

Management.—6. The.....(Grantor).....shall have entire charge and control of the operation and maintenance of the joint section, the use of which is hereby granted to the .....(Grantee).....

Rental.—7. The.....(Grantee).....agrees to pay to the ....(Grantor)....during the continuance of this agreement:

(a) A sum equivalent to.....of the interest at the rate of.....per cent (....%) per annum on..... Dollars ($.....), hereby agreed upon between the parties hereto as the value of said joint section as of the effective date of this agreement;

(b) A sum equivalent to.....of the interest, at like rate, on all assessments and on the cost of additions, extensions, improvements and betterments used by the....(Grantee)...., which may from time to time be made to said joint section;

(c) A sum equivalent to.....of the taxes assessed against said joint section;

(d) A sum equivalent to.....of the depreciation and obsolescence on structures as listed in the following schedule:

Note.—See alternate bases for rental at end of this form.

(e) That proportion of the cost and expense of operation and maintenance of said joint section which the car and engine mileage of the.....(Grantee).....thereover in each month shall bear to the total car and engine mileage (each engine to be counted as two cars) thereover in such month; insurance to be included in operation and maintenance.

(f) All bills shall be payable monthly, 30 days after rendition. To the cost of all material there shall be added, and from all credits for scrap or secondhand material there shall be deducted fifteen per cent (15%.)

Other Tenants.—8. In event of any other company or companies being granted a similar right to the joint use of said joint section or any part thereof, bills for rental under paragraphs (a), (b), (c) and (d) hereof shall be subject to a proportionate reduction with respect to the facilities used by any other company or companies.

Express Business.—9. Neither party to this agreement shall have any agreement with any Express Company for carrying express matter upon or over said joint section which will in any way interfere with the rights of the other party to carry its express matter or messengers on or over the same.

Telephone and Telegraph Lines.—10. (To suit local conditions.)

Rights of Trains.—11. Trains of a superior class of either party shall have preference over trains of inferior class of both parties. Trains of the..... .....shall have preference over trains of the.....of the same class.

Schedule and Time Tables.—12. Joint schedules for the movement of trains over said joint section shall be made by the.....(Grantor).....

The expense of printing time tables and supplements thereto shall be borne by the party requesting the change of time, or if made necessary by a general change of time it shall be borne on the basis of operating expense.

Operation and Maintenance.—13. Each party to this agreement shall furnish, without expense to the other party, all labor, fuel and train supplies necessary for the operation of its own trains. The.....(Grantor)..... shall furnish all other labor, materials and supplies necessary for the operation and maintenance of said joint section, the expense to be divided in accordance with the provisions of Section 7 (e.) The joint section shall be maintained in a condition considered necessary by either party for its best class of service over said joint section.

Joint Employees.—14. All persons employed for the common benefit of the parties hereto, in the maintenance or use of the said joint section, shall, while so employed, be considered as joint employees. Persons engaged partly in the maintenance or use of said joint section shall be considered as joint employees only while engaged in the work for the joint use and benefit of both parties. Train employees except employees of work trains working on the joint section shall not be considered joint employees.

Removal of Employees.—15. If any employee of the ....(Grantee)....shall neglect or refuse to abide by the rules and regulations established by the.....(Grantor)..... governing the operation and maintenance of said joint section, such employee upon written request of the....(Grantor)..... shall be prohibited from working upon or over said joint section.

Bonding.—16. All employees collecting or receiving money

so far as concerns the business or revenue of the ....(Grantee)....shall be the employees of that company and shall report and remit direct to it. The....(Grantee).... may bond such employees or require them to furnish bonds, and the.....(Grantor).....shall not be liable to the.....(Grantee).....for their neglect or default.

Liability.—17. Liability for all loss of or damage to property and injury to or death of persons (all hereinafter collectively referred to as damage), in any manner originating or occurring upon or in connection with the operation of the property and facilities covered by this agreement, shall be governed by the following provisions:

For the purposes of this article, all property, the joint use of which is herein granted, shall be considered the joint property of the parties hereto; and employees of either party engaged in or charged with the duty of the operation, care or maintenance of the property and facilities covered by this agreement shall be considered joint employees of the parties hereto.

Each party hereto shall be liable for all damage to whomsoever occurring, which shall be caused in any manner by or in connection with its trains, engines, cars, business or traffic, when the trains, engines, cars, business or traffic of the other party are in nowise involved.

Each party hereto shall be liable for all damage to whomsoever occurring which shall be caused solely:

(a) By defect in its sole property or property separately used by it.

(b) By act or by the negligence of its separate employees.

Otherwise, each party shall be liable for all damage to its separate property, employees or traffic. All other damage and costs and expenses in connection therewith, including those resulting from undetermined causes, shall be borne equally by the parties hereto.

Each party shall adjust the claims of its own passengers and employees, but no settlement for which the other party is to be held wholly responsible, and no settlement in excess of Five Hundred Dollars ($500.00), for which the other party is to be held jointly responsible, shall be made without its concurrence.

Clearing Wrecks.—18. The.....(Grantor).....shall promptly pick up and remove all wrecks which occur on the joint section.

All equipment and salvage so picked up, which belongs to or is being handled in the business of the....(Grantee).... shall be promptly delivered to it.

The cost of picking up and removing wrecks, including rental for equipment used in connection therewith, shall be borne in accordance with the provisions of Section 17 hereof.

Suits.—19. In event of any suit being brought against either party hereto, for which the other party may be held liable, the party against whom such suit is brought shall at once give the other party notice in writing thereof in order that the other party may make such defense as it may deem proper, and in such case the party that is liable as herein provided shall pay all attorneys' fees, costs and expenses incurred in defending such suit, as well as damages that may be recovered therein.

Interruption of or Delay to Traffic.—20. During any time traffic over the joint section is interrupted, the.....(Grantor).....shall not be required to furnish the .....(Grantee).....use of any other of its tracks. The.....(Grantee).....shall make its own arrangements for detouring its trains and shall assume the entire cost thereof.

Neither party shall under any circumstances have any cause of action against the other for loss or damage of any kind caused by or resulting from such interruption or delay to its business.

Examination of Accounts.—21. The accounts of the..... ....(Grantor)....., so far as they relate to the valuation or expenses of operation and maintenance of said joint section, shall be open at all reasonable times to the inspection of the proper officers of the .....(Grantee).....

Default.—22. If the.....(Grantee).....shall make default in any of the payments hereinbefore required of it to be made, or shall fail to faithfully perform any of the covenants herein required by it to be performed, then in such case, and if such default or failure shall continue for a period of.....(....) days after the.....(Grantor)..... shall have given the.....(Grantee).....a written notice thereof, the.....(Grantor).....may, by a.....(....) days' notice in writing to the.....(Grantee).....declare this agreement terminated, and may at the termination of the .....(....) days in said notice mentioned, exclude the .....(Grantee)..... from the use and enjoyment of any and all of the premises and rights hereinbefore granted to it and the.....(Grantee).....shall surrender to the..... (Grantor).....all of said premises, and shall have no claim or demand upon it by suit at law or otherwise, on account of such exclusion. Provided that failure to make any payment or perform any covenant which is the subject of arbitration or of litigation between the parties hereto, shall not, pending arbitration or litigation, be deemed a cause of forfeiture hereunder.

The.....(Grantor).....may waive any such default or failure, but no action of the.....(Grantor).....in waiving such default or failure shall extend to, or be taken to affect any subsequent default or failure, or impair its rights.

Arbitration.—23. In case any question arises under this agreement or concerning the subject matter thereof, upon which the parties hereto cannot agree, such question shall be settled by a sole disinterested arbitrator to be selected jointly by the parties to this agreement.

The expense of arbitration shall be apportioned between the parties hereto, or wholly borne by either party, as may be determined by the arbitrator.

Term.—24. This agreement shall take effect on the..... day of....., 19...., and shall continue in force for the period of.....years from said date and thereafter until terminated on a date specified by a written notice given to either party by the other party at least.....prior to such date of termination.

Successors.—25. All the covenants and agreements herein contained shall be binding upon and inure to the benefit of the successors and assigns of the respective parties hereto, provided, however, that the.....(Grantee).....shall not assign or transfer the rights hereby granted to it, without the written consent of the.....(Grantor).....

Execution.—26. IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above written.

.....(Corporate name of Grantor).....
By .....
President.
Attest .....[SEAL]
Secretary.
.....(Corporate name of Grantee).....
By .....
President.
Attest .....[SEAL]
Secretary.

Alternate Bases for Rental.—NOTE.—In the place of the provisions of Section 7 the rental may be a lump sum or may be on the basis of train miles.

In any case the elements which usually enter into the expense on which rental is based are as given in Section 7.

Discussion

W. D. Faucette (chairman): Sooner or later the National Conference for Uniform Construction Contract Forms consisting of members of this association, the American Society of Civil Engineers, the American Water Works Association, the American Institute of Architects, the National Builders' Exchanges, the Associated General Contractors, and one or two others, will present to you, no doubt, some form of a national construction contract and you will be called upon to say whether or not you will accept that contract in lieu of the contract now existing in the Manual. I stress this because in after years if this matter is presented to you and you tacitly and quietly accept it without reading it, you may wake up some day to find out you have approved something not entirely to your liking. All this committee can do is to point out that no doubt this will be presented a year hence.

In the last meetings of these national conferences there was a sub-committee appointed consisting of representatives from these associations. The sub-committee reported that they would no doubt change the name of this national construction contract and omit therefrom the word "railroad." If that is done, the question will then possibly be whether or not the national construction contract, not specifically applied to railroads but applied to construction generally, should in any measure be a substitute for the railroad construction contract appearing in the Manual.

If the Joint National Conference, as a whole, adopts

that idea and eliminates from this contract the word "railroad," then you will not be presented, apparently, with the contract which is to do with railroad construction primarily. The contracts which have been presented to us for consideration, were built up largely upon the form of contract that was conceived and put into effect for the American Institute of Architects, and no doubt that form of contract well covers the ground in the architectural and building world. Many of the paragraphs therein could not be adapted to the work of railroad organization nor could they be adopted in lieu of the one in the Manual without considerable qualifications. (The reports of the various sub-committees were presented by the sub-committee chairmen. Each report was adopted for inclusion in the Manual or accepted as information according to the recommendations of the committee as shown in the report, after which the committee was dismissed with the thanks of the association).

Report of Committee on Buildings

One of the important subjects on which the Committee on Buildings has been working for a number of years has been the preparation of specifications for railway buildings. These specifications have been before the Association for several years, and this year they were presented for adoption in the Manual. At the 1922 convention the committee presented as information a detailed report on ice houses and icing stations. This year the committee presented a report on the recommended practice in design and operation of these facilities for inclusion in the Manual. Information derived from 37 representative railways was presented in a report covering all types of floors for railway buildings. W. T. Dorrance has been chairman of this committee for four years and a member for the last nine.

W. T. Dorrance
Chairman

THE COMMITTEE PRESENTED no changes or revisions in the Manual, although considerable work has been done on this work. No additional work was done on freight house design. The specifications for railway buildings previously offered were submitted for inclusion in the Manual. In Appendix A the committee presented for inclusion in the Manual a condensed and revised report of the information presented before the 1922 convention on ice houses and icing stations. A report on floors for railway buildings was presented in Appendix B, with the recommendation that the conclusions be included in the Manual. Considerable information was collected during the year on the subject of ventilation but no report was submitted. No work was done on the subject of ornamental roof coverings for passenger stations. A report on paints for railway buildings was submitted in Appendix C for inclusion in the Manual.

Committee: W. T. Dorrance (N. Y. N. H. & H.), chairman; J. W. Orrock (C. P.), vice-chairman; P. S. Baker (P. & R.), G. A. Belden (C. of Ga.), Eli Christiansen (C. R. I. & P.), Arthur Crable (H. V.), H. G. Dalton (C. B. & Q.), J. E. Danes (Wab.), W. L. Darden (S. A. L.), F. M. Davison (N. Y. C.), Hugo Filippi (W. H. Brown & Co.), J. B. Gaut (G. T.), E. A. Harrison (A. T. & S. F.), A. C. Irwin (Portland Cement Assn.), F. R. Judd (I. C.), G. A. Mitchell (C. N. R.), Milburn Moore (Railway Age), L. G. Morphy (Rutland), R. V. Reamer (C. of N. J.), F. L. Riley (B. & O.), G. A. Rodman (N. Y. N. H. & H.), A. L. Sparks (M. K. T.), O. G. Wilbur (B. & O.).

Appendix A—Ice Houses and Icing Stations

Icing stations may be built to handle (1) natural ice, (2) artificial ice, and (3) a combination of both natural and artificial ice. Provision must be made at many plants for the handling of a certain amount of crushed ice. They may be divided into two classes, according to the method used to handle the ice, namely, gravity stations and mechanical stations. The method of operation indicates the general design to be used in construction. Gravity plants are much cheaper to build than are mechanical plants, but are slower in operation.

The design selected, either gravity or mechanical, should be one in which the ice is always under control, so there will be no collision of the cakes in transit, thus avoiding delays and loss of ice by breakage. Back travel and duplicate handling of the ice should be avoided.

The location of the house, number and arrangement of rooms and location of platforms and machinery require careful study to assure economical and rapid operation, both in filling the house and icing cars.

Where natural ice is harvested houses are filled by means of portable slides, made up in sections and laid on the ground from the source of supply to the foot of a motor-driven elevator at the house. If the local ice supply is not sufficient or if the station is entirely dependent upon ice shipped in, a platform, at car floor height, must be provided along the track side of the house. This platform may be used in loading ice for shipment as well as for handling ice to storage.

Where large capacity is required it is desirable to build the house higher rather than to spread it out. Heights from 18 ft. to 36 ft. are generally used.

To prevent rise of temperature, due to heat passing through the ground, some of the storage space should be below the grade line, extending about a foot below frost line, if drainage is obtainable.

Ice houses are generally of frame construction with a gable roof. The side walls of the storage house should be so constructed as to afford maximum insulation. If a concrete foundation is not provided, the walls should be tied together at the bottom with rods to prevent spreading. These rods should be below the floor line to avoid obstruction. In the storage portion of the house the use

of interior supporting members should be avoided, as they interfere with the handling of the ice. The floor may be wood plank on sleepers set in a cinder bed, concrete on cinders or a combination of concrete and cork, as conditions warrant. Floors should pitch slightly toward the center so that when the house is filled the ice will not throw any stress on the outside walls. A drain tile should be laid through the center of the house for drainage.

Platforms for icing cars may be single or double-deck. Where single platforms are used the height is generally 13 ft. to 16 ft. 6 in. above top of rail. Where two-deck platforms are used general practice is to have heights of 13 ft. to 14 ft. for the lower one and 20 ft. to 23 ft. for the upper one. Double-deck platforms need not be wider than 12 ft., as cake ice is handled on the lower one and crushed ice, in two-wheeled carts, on the upper one. Single platforms should be somewhat wider, as both kinds of ice are handled on the same platform. A suitable distance from center line of icing track to the platform is 6 ft. Provision should be made on platforms for a supply of salt. Ample arrangements should be made for lighting so that night operation can be carried on.

At important stations it is desirable to provide two tracks, one on each side of the platform, so two trains can be iced at the same time.

Where operating conditions require it, mechanically operated endless chain platform conveyors and inclines should be installed.

Reference is made to the building committee's report in the Proceedings, Vol. 23, page 841, for further details of design and construction.

Appendix B—Floors for Railway Buildings

The committee collected information from 37 representative railways, embracing 166,275 miles of line, in order to determine what type of floor is most commonly used in the various kinds of buildings. The data thus obtained were summarized and the results presented in the following conclusions for publication in the Manual:

Conclusions

Freight Houses.—A plank floor, laid on wooden joists, is satisfactory and economical, except in locations of considerable importance and is suitable for all frame buildings. Where considerable trucking is done the use of a maple wearing surface is recommended. In larger and more important freight houses, a floor of greater first cost is justified and is usually concrete. Concrete floors are fairly permanent, sanitary and easy to keep clean. Their disadvantages are failure of the wearing surface, especially at expansion joints, and an unyielding surface, which occasionally produces complaints from truckers. Expansion joints should be as few as possible and located outside of the heavily used surface wherever practical. If a concrete surface is not considered suitable, some different type of wearing surface, such as square edge maple, wood or asphalt blocks or asphalt mastic may be laid on the concrete.

Transfer Platforms.—Wood plank platforms should preferably be laid with the planks parallel to the line of trucking traffic. Metal plates may be used for a runway to produce easier trucking and to reduce wear on the plank. Concrete floors are used in some cases and for extremely heavy traffic, a concrete base with creosoted wood or asphalt bastic wearing surface is used.

Freight Storage Houses.—For freight storage houses, which are usually of fireproof construction, concrete floors are generally approved.

Freight Piers.—Floors on freight piers must, of necessity, largely conform to the style of construction used in the pier. They should be fire-resisting and in many cases must have flexibility enough to take up the vibration caused by boats being moved along the pier.

Engine Houses.—For minor houses, where not many running repairs are made, a floor of clean engine ashes, well compacted, is sufficient to meet all requirements. For houses of more importance, concrete or brick give excellent results. For houses of a still higher grade a floor of brick or creosoted wood blocks on a concrete base is suitable if the greater initial cost is justified. Asphalt floors, either mastic or block, if used for engine houses, should be of such composition as to resist the action of steam and oil.

Blacksmith Shops.—Floors of cinders, earth or clay are to be preferred in all cases.

Machine Shops.—In small buildings a wood plank floor, of thickness suited to the severity of service, is common practice. For buildings of a higher grade, wood blocks (preferably treated), asphalt blocks or mastic give excellent results. Concrete floors may be used where local conditions justify this construction as economical, although their lack of resiliency may result in discomfort to employees and their hard surface may damage tools dropped upon it.

Paint Shops.—In passenger car paint shops a concrete floor meets all requirements and it is doubtful if a more expensive type of floor is justified. In freight car shops, where paint is sprayed on, a floor of cinders is suitable.

Freight Car Repair Shops.—Wood floors can be used if something better than cinders is desired and if provision has to be made for trucking material between tracks. Concrete is very satisfactory for a floor of higher grade.

Store Houses.—Concrete floors are satisfactory and are in common use, but for locations where very heavy material is handled, wood blocks, asphalt block or mastic are to be preferred. In small storehouses, at outlying points, the ordinary wood plank floor is commonly used.

Oil Houses.—Because of the necessity for fireproof construction, concrete is recommended for oil houses.

Carpenter Shops.—In carpenter shops where considerable bench work is done, wood plank floors are desirable because of the comfort to workmen they afford. Concrete floors are more easily kept clean and are sometimes used.

Office Buildings.—Office buildings of the better class should have oak, maple or dense pine floors as indicated by the use for which the various rooms are intended. Hallways and toilets should have floors of concrete, marble, tile (either natural or composition), terrazzo or some kind of a sanitary composition, provided the importance of the building warrants the expenditure. For office buildings of lesser importance, floors of composition, concrete or pine are satisfactory. If concrete is used it is desirable to provide some kind of a resilient covering for added comfort to employees.

Passenger Stations.—In large city stations and in suburban stations of importance terrazzo, tile or some high grade type of composition floor are generally accepted as best meeting the requirements. In such locations the architectural suitability of a floor is of as much importance as its wearing qualities. For ramps, a non-slip wearing surface is essential. For small stations concrete or wood floors are commonly used. In stations where concrete or terrazzo floors are used, a wood or other type of resilient floor covering should be provided in the ticket office.

Signal Towers.—Floors in signal towers may be of concrete, composition or wood, depending upon the type of construction of the building. When concrete is used in connection with electrical machinery, precaution should be taken to secure a non-dusting surface.

Appendix C—Paints

In general there are two methods for specifying and ordering paints: (1) To order the proper grade product of a reputable manufacturer. (2) To order in accordance with specifications or formulas prepared by the railway company. There are manufacturers who produce and sell efficient paints. They have studied the subject exhaustively and are constantly trying, by improving methods, to increase the efficiency of their product.

This committee believed that satisfactory and economical results can be obtained by placing the requirements that the various classes of paint are to meet before the reputable manufacturers and depending on their judgment and ability in producing the most efficient paints for the service expected. By keeping proper service records of paints there will be sufficient data to select the proper standard product of a number of manufacturers for the purpose required. However, in judging paints from service records, it must be borne in mind that one paint failure does not necessarily indicate that a poor

quality of paint was used, inasmuch as the service life of a paint may be as much dependent on the method of application as upon the paint itself.

In ordering paints under specifications or formulas prepared by the railway company, the paint formulas must be properly prepared and developed by experts in paint technology. The formulas should be revised from time to time so as to include improved manufacturing methods and newly discovered materials.

In the purchase of paint many substitutions may be made which will still come within the letter of the specifications and many processes of mixing and grinding can be used which, even with the best ingredients, will produce a poor paint.

Chemical analyses of paints will to a certain extent detect substitutions of improper materials, but may not show up imperfect methods of manufacture.

In preparing specifications for the purchase of paints, better results will generally be obtained by specifying rigid physical tests as a method of judging quality, rather than by giving definite formulas based on chemical composition.

The service life of a paint is as much dependent upon its correct application as upon the composition of the paint itself.

The most important factor in painting work is to see that the surface on which the paint is to be applied is properly prepared. Such surfaces should be clean and dry and free from conditions which might have a tendency to cause the paint to scale, blister or discolor.

Specifications for painting new buildings have already been published in Vol. 24, under the title of "Specifications for Railway Buildings," Section 9.

Paints should be furnished preferably in cans, mixed to the proper consistency for direct application for recoat work. Under certain condition paints will require some thinning, which should be done only with pure spirits of turpentine or linseed oil.

The committee recommended that a record of all painting work done on buildings be kept on suitable forms, and that the date painted be stenciled on buildings.

The failure of a paint coating before its expected life has been reached is a loss to the railway company, both from the partial loss in materials and labor used and from the deterioration of the structural materials in the building due to the lack of protection furnished.

Premature chalking, checking, blistering, cracking, scaling, fading and general disintegration are the ordinary indications of paint failure.

Climatic conditions, such as proximity to salt water, high humidity, etc., have very marked effects on the life of paint coatings, and paints for use under such conditions may require special formulas and methods of manufacturers to obtain satisfactory results. Paints used around engine terminals and manufacturing plants, where acid fumes are present, will likewise be affected by these conditions.

Economies can be effected in painting work by obtaining proper material and by careful supervision, seeing that these are properly applied, and by keeping complete and accurate service records. Those paints which do not give the required service can be eliminated and work which is being done inefficiently can be detected.

Discussion

(In the absence of Chairman Dorrance, the report of the committee was presented by F. R. Judd (I. C.), who *moved that it be adopted.*)

C. C. Westfall (I. C.): The specifications which have been offered include specifications for concrete. The Masonry Committee about three years ago presented a very complete specification for concrete, and that was adopted by the Association. The specifications submitted by the Committee on Buildings are, in the main, a copy of the specifications which are now in the Manual. I think there are probably six or eight sections where there are, in some cases, minor changes in the work. It was the thought of the Masonry Committee that it not only overloads the Manual to have repetition of the same material, but from the standpoint of the Association it is unnecessary to have this duplication.

Mr. Judd: The committee is willing to withdraw the specification on masonry and presents the others for publication in the Manual.

President Lee: I think that removes Mr. Westfall's objection.

Maurice Coburn (Penn.): Is it the intention of the committee to include with these specifications the reference to the specifications in the Manual under the heading of the Masonry Committee?

Mr. Judd: That was our intention and if there was any particular item in these specifications which we felt we should use and resubmit we would do that next year with reference to the specifications as already prepared by the Masonry Committee.

(*The motion to adopt for publication in the Manual these specifications which had already been prepared by the Masonry Committee was carried, following which the motion as applied to the adoption of the report on Ice Houses and Icing Stations was also carried.*)

Hunter McDonald (N. C. & St. L.): In Appendix B committee deals with the question of freight house floors. The committee doesn't seem to have taken into consideration a form of treatment of wooden floors with which I have had some familiarity; that is the application on wooden floors of an asphaltic concrete. We have found that, very much superior to the maintenance of ordinary wooden floors in freight houses, and entirely feasible where the planks are well fastened down and not worn too thin. I believe that the installation would pay for itself inside of four years in the saving of trucks as between the wooden floor and the asphaltic concrete floor.

E. A. Frink (S. A. L.): The committee seems to have overlooked the construction of a wooden floor on fill. Now in many cases where conditions are favorable, everything being considered, that is a very economical type of floor. It is usually constructed by filling with some material like cinders or gravel, on top of which is placed a layer of tarred cinders or cinders mixed with some asphaltic compound on which is laid three-inch creosoted plank, and on top of that a seven-eighths inch wearing surface. That gives a floor, except for the ⅞-in. wearing surface, that needs practically no repairs for a very long time. It doesn't cost as much as a concrete floor and is excellent to truck over and for general freight house purposes.

Mr. Coburn: I have no objection to the acceptance of this information in the committee's report, but it seems to me there is a lot of information we ought to have that has not been included. For instance, in the last sentence about the freight house floors, the statement is made that if a concrete surface is not considered suitable, some different type of wearing surface, such as square-edge maple, wood or asphalt blocks or asphalt mastic may be laid on the concrete. We ought to have information as to comparative costs of the different types and their comparative values. There is information about treatment of concrete surfaces which some people use which is very interesting, and a good many things

of that sort. Many disagree with the statement that a cinder floor in an engine house is satisfactory.

Arthur Crable (H. V.): The sub-committee, in making a study of this subject very early in its work, found there were many types of floors which might be considered. Our effort has been to pick out only those types which seem to be of the most common application.

The matter that was mentioned about covering the wooden floors with some sort of a mastic composition appealed to the committee as being more a matter of repairs to old floors rather than the installation of new floors, which was the part of the subject that the committee was considering directly.

The committee feels that the information given in the report, and the conclusions that have been drawn, are sufficiently broad to cover most cases. Inasmuch as the subject is treated in a general way, these recommendations might well be considered as Manual material as they stand. If future developments indicate that additional information should be included, the committee would be willing to make additions to the report as it stands.

Mr. McDonald: The natural inference from the last sentence of the paragraph on freight houses is that mastic concrete is only suitable for concrete foundation. There is in this city, in the Parmelee stables, an instance of asphaltic concrete laid over wooden floor, which, I think, has been in use over eight years. Anyone who is interested in that matter would be well repaid to look at that floor.

G. J. Ray (D. L. & W.): I would like to see that paragraph on Freight Houses referred back to the committee. I think there are a good many different treatments that a freight house floor can be given both in construction and maintenance which ought to be covered in the report, if it is to be put in the Manual.

I have in mind two or three important freight house floors where we decided that concrete was unsuited on account of the trouble had with the wearing surface where there is lots of trucking. We decided to put in a creosoted wooden floor on the base, over which we laid a plain maple flooring untreated. That floor has given the best service of any floor on our railroad.

In the first place, we have a treated sub-structure which does not fail. The surface is maple, which, laid on the creosoted wood, has given perfect satisfaction from the standpoint of trucking and from the standpoint of preservation. The sap wood in the maple becomes saturated with the creosote oil from the timber beneath, preserving it absolutely, and we all know that there is nothing to wear with the maple floor. The further advantage is that where the maple floor does wear out it can very easily be removed and replaced in a short space of time with no inconvenience to the use of the building and with very little cost for actual maintenance.

Mr. Coburn: *I move that this report be accepted for printing in the Manual, excepting the clause about freight house floors, and excepting the first paragraph under Engine Houses, which states, "For minor houses, where not many running repairs are made, a floor of clean engine ashes, well compacted, is sufficient to meet all requirements."*

President Lee: There is another angle of the situation which appeals to me very strongly. I doubt very much whether the committee has emphasized sufficiently the great importance of a good surface in freight houses and where trucking is performed. We all know of the continual struggle to keep a good surface smooth, but a good trucking surface in a freight house probably effects relatively much greater economies in the transportation of the freight than a smooth track does in handling trains. I think that that is worth very careful consideration, and I personally feel that Mr. Ray's statement that his particular type of floor is the best trucking surface would be found to be pretty accurate.

(*The motion was carried.*)

(*The motion was then made to adopt the report on Paints for Railroad Buildings, in Appendix C, for publication in the Manual. Motion carried. The committee was then excused with the thanks of the association.*)

Report of Committee on Standardization

The work of the Committee on Standardization during the past year has consisted primarily in cooperating with other committees and other societies or outside committees in the promotion of standardization. General specifications for steel railway bridges and specifications for movable railway bridges were prepared for submission to the American Engineering Standards Committee. Since these specifications were submitted the American Society of Civil Engineers has also submitted its specifications for steel railway bridges to the A. E. S. C. Progress was reported by the committeen on the standardization of lumber, etc. The A. E. S. C. was discussed and recommendations made that participation in it be continued. E. A. Frink has been chairman of the committee since its organization.

E. A. Frink
Chairman

NO SUBJECTS WERE ASSIGNED to this committee for study and report and no instructions were issued. As a progress report, the committee submitted the following:

The Committee on Track has prepared additional plans for double slip switches, solid manganese crossings, and also for spring rail frogs and slip split switch fixtures for heavy rail of 6½ in. height and over, and specifications for track tools. When these are approved by the Association, they will be submitted to the Committee on Standardization for further action.

During the year the general specifications for steel rail-

way bridges and the specifications for movable railway bridges were prepared by the committee for submission to the American Engineering Standards Committee for standardization. Progress is being made in this matter by the A.E.S.C. Since these specifications were submitted, the American Society of Civil Engineers has submitted to the A.E.S.C. its specifications for steel bridges.

The committee has co-operated with the American Petroleum Institute with the view of revising the rules for the protection of oil sidings from danger due to stray currents meeting. The committee has co-operated with the U. S. Bureau of Standards in revising the National Electrical Safety Code under the procedure of the A.E.S.C. The committee has co-operated with the A.E.S.C. in the preparation of specifications for insulated wires and cables.

The committee recommended:—1. Continued co-operation with the American Engineering Standards Committee and the Bureau of Simplified Practice.

2. Instruct the various committees to select designs and specifications already in the Manual and prepare them for submission for standardization to the American Engineering Standards Committee.

Continued progress is being made in standardization in no less than 16 countries, although the largest organizations and those accomplishing most are the German, British and American, which in point of accomplishment rank in the order named. In Germany, there are at present more than 700 national standards, of which more than 400 have reached the final approved stage. By far the greater part of this work in Germany is dimensional, this being much further developed and standard specifications relatively less developed than is the case in England and America. A large part of the business of the Standards Association is in the publication and sale of standards, which averages about 100,000 sheets per month. In addition to this, many of the large firms in Germany reprint these standards and, to some extent, specifications.

The Department of Commerce is continuing its work along these lines, one of the noteworthy achievements this year being the beginning of the standardization of lumber. This has been in progress for considerably over a year, being handled by a body known as the Central Committee on Lumber Standards, consisting of eight members, the railroads' representative being W. E. Hawley, assistant engineer, Duluth, Missabe & Northern, Duluth, Minn. This committee was assisted by a consulting committee, consisting of some 30 members, the railroads' representatives being John Foley, forester, Pennsylvania, Philadelphia, Pa.; Louis Yager, assistant chief engineer, Northern Pacific, St. Paul, Minn.; E. A. Frink, principal assistant engineer, Seaboard Air Line, Norfolk, Va.; Hermann von Schrenk, consulting timber engineer, St. Louis, Mo., and A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe, Chicago, Ill. The result of their work covered the establishment of standard classifications and the adoption of certain minimum dimensions for a standard board and standard dimension, which terms replace the old designation of 1-in. board and 2-in. dimension. Much other important matter is contained in their report, which was presented to a general conference called by direction of Secretary Hoover in Washington on December 12, 1923, and adopted by it. It is hoped that general use of these standards will result.

In pursuance of its simplification program, the Division of Simplified Practice has been in correspondence with Division VI—Purchases and Stores, American Railway Association. This has resulted in the issuance of a call by U. K. Hall, Chairman of Division VI, to the Operating, Transportation, Engineering and Mechanical Divisions of the A.R.A. to join with Division VI in the formation of a joint committee to make an intensive study relative to reducing to a minimum the number of items carried in stock for the purpose of making definite recommendations to the American Railway Association as to the means of accomplishing this object. There is evidently a large field for this work and it is hoped that the committee will accomplish good results.

The committee has co-operated this year with the work of the various committees of the American Engineering Standards Committee. The following statistics give a general idea of the growth of this organization:

Member-Bodies—organization or groups of organizations whose representatives form the A.E.S.C.	24
National organizations included in the member-bodies	35
Representatives forming the main committee	58
Standards approved to December 8, 1923	49
Standards up for approval by the A.E.S.C. on December 8, 1923	35
Projects having official status (already approved, or on which work is under way)	150
Organizations acting as sponsors for projects	54
Trade, technical or governmental bodies co-operating through representatives on special or sectional committees	299
Individuals on sectional committees	1028

Of the individuals now serving on sectional committees, 45 are representatives of the A.R.A., having been selected by appointment by the section or division represented, and in the case of the A.R.E.A. by the committee under whose jurisdiction the work properly falls. Developments of the past year indicate that the work of the A.E.S.C. will continue. The committee believed that it is to the interest of the railroads to co-operate fully in this work and that its results will be largely to the railroads' advantage.

Committee: E. A. Frink (S. A. L.), chairman; J. R. W. Ambrose (Toronto Term.), vice-chairman, W. C. Barrett (L. V.), F. L. C. Bond (C. N. R.), G. D. Brooke (B. & O.), W. A. Clark (D. & I. R.), C. C. Cook (B. & O.), S. D. Cooper (A. T. & S. F.), O. F. Dalstrom (C. & N. W.), W. T. Dorrance (N. Y. N. H. & H.), J. M. R. Fairbairn (C. P. R.), W. D. Faucette (A. C. L.), Maro Johnson (I. C.), E. B. Katte (N. Y. C.), E. E. King (Univ. of Ill.), C. R. Knowles (I. C.), C. M. McVay (N. Y. C.), A. Montzheimer (E. J. & E.), F. E. Morrow (C. & W. I.), G. J. Ray (D. L. & W.), A. O. Ridgway (D. & R. G. W.), F. J. Stimson (Penna.), H. M. Stout (N. P.), C. C. Westfall (I. C.), F. B. Wiegand (N. Y. C.), W. P. Wiltsee (N. & W.).

Discussion

E. A. Frink (chairman): The American Engineering Standards Committee has been working for several years under a certain constitution and by-laws, and one of the provisions of that constitution and by-laws is that it gives to the sponsor or sponsors of any project a veto power. That is, after a sectional committee working under the direction of a sponsor has produced a result, if the sponsor does not approve it, by expressing its disapproval the matter is stopped right there until it is in shape for the approval of the sponsor.

In the case of an association like the American Society of Testing Materials or the American Railway Engineering Association or any one that has spent a great deal of time and labor on compiling a specification or making up a design, it is of importance that they be enabled to control the future of that project. If an association realizes, when it puts its project up to the American Engineering Standards Committee for its approval that the project is liable to be changed out of all resemblance to its original shape, that association is going to hesitate. I do not think it will be wise for the American Engineering Standards Committee to depart from that practice. Unfortunately there has been a revision of the rules formulated which entirely removes from the sponsor that veto power.

That revision of the rules and constitution is coming

up for action on March 27. We had a preliminary discussion on it last December, at which time I was the only member who objected to the change. I have said several times that we ought to have more representation on that committee because I needed help and I never needed it any more than I am going to need it the twenty-seventh of this month. In order to get this matter on the records I have written out the following resolution:

RESOLVED, That the American Railway Engineering Association believes it will be a serious mistake on the part of the American Engineering Standards Committee so to change its constitution and rules of procedure as to eliminate or even impair the veto power now possessed by the sponsor or sponsors of a project. *I move the adoption of that resolution.*

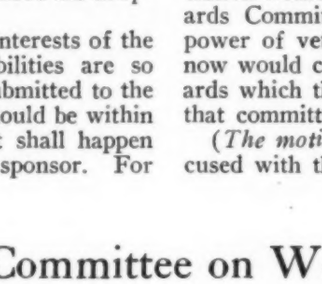
J. L. Campbell (E. P. & S. W.): The interests of the railways are so large and our responsibilities are so definite that I believe as a rule anything submitted to the Standards Committee by this association should be within the control of the Association as to what shall happen to it and as it is now controlled by the sponsor. For example, a specification of this Association for steel railway bridges has been submitted to this committee for standardization and certainly it is the desire and the interest of this association to have those specifications, which represent the work of 20 years of a very able committee supported by your action annually here on the floor, approved. That is a specification the transportation business needs. We don't want that thing torn to pieces, and if it is adopted as a standard in all the essential and important things, we want that to be as it now stands, and the only modification that we would want to be would be in immaterial things.

Chairman Ray: It is very doubtful whether our association would have ever entered into the American Standards Committee in any manner had we not had the power of veto in the first place, and to take that away now would certainly be a very serious matter for standards which this association may see fit to sponsor before that committee.

(*The motion carried* and the committee was then excused with the thanks of the association).

Report of Committee on Water Service

The work of the Committee on Water Service during the past year included reports on drinking water on trains and railway premises with some interesting remarks regarding the use of over-treated water for this purpose; on the pitting and corrosion of boiler tubes and sheets; on the value of water treatment with figures on costs of repairs to locomotives; a method of water analysis for publication in the Manual; the automatic control of electrically-operated pumps; on joints for cast iron pipe; on a method of watering and showering hogs in transit and on the use of treated wood for tanks. The use of treated wood for water tanks has resulted in a large number of satisfactory installations. C. R. Knowles, the new committee chairman, has been a member of it for eight years.



C. R. Knowles
Chairman

THE COMMITTEE presented a number of revisions to the Manual in Appendix A and a final report on methods of water analysis in an Appendix D for inclusion in the Manual. It also submitted final reports as information on the following subjects: Automatic control of electrically operated pumps in Appendix F; methods of watering and showering hogs in transit in an Appendix H; and use of treated wood in tanks in Appendix I. Progress reports were submitted on the drinking water supply on trains and premises of railways in Appendix B; pitting and corrosion of boiler tubes and sheets in an Appendix C; value of water treatment in Appendix D; and joints for cast iron pipe in an Appendix G.

Committee: C. R. Knowles (I. C.), chairman; R. C. Bardwell (C. & O.), vice-chairman; W. M. Barr (U. P.), S. C. Beach (I. C.), O. W. Carrick (Wab.), R. W. Chorley (Penna.), J. H. Davidson (M. K. T.), A. F. Dorley (M. P.), C. H. Fox (C. P. R.), B. W. DeGeer (G. N.), E. M. Grime (N. P.), W. L. R. Haines (Penna), H. H. Johntz* (M. K. T.), C. H. Koyl (C. M. & St. P.), P. M. LaBach (C. R. I. & P.), E. G. Lane (B. & O.), M. E. McDonnell (Penna.), E. H. Olson (A. T. & S. F.), A. B. Pierce (Sou.), H. H. Richardson (M. P.), H. L. Roscoe (K. C. S.), F. A. Russell (Univ. of Kans.), T. W. Sedwick (C. R. I. & P.), D. A. Steel (*Railway Age*), C. P. VanGundy (B. & O.), F. J. Walter (N. C. & St. L.), F. D. Yeaton (C. M. & St. P.).

*Deceased.

Appendix A—Revision of the Manual

The committee submitted the following revision to the Manual:

(a) Page 628—Second sentence under "Supply—Source"—should read:

Springs should be carefully investigated to determine their yield and quality.

(b) Page 629—Second sentence—should read:

Artesian well, where obtainable and the quality of the water is suitable for boiler use, are satisfactory source; however, their yield is liable to constantly decrease.

(c) Page 634—Fourth paragraph, sentence should read:

Stoves and lights should not be permitted in gasoline or oil storage rooms.

Appendix B—Regulations of Federal or State Authorities Pertaining to Drinking Water Supplies

July 1, 1924, all railroads will be required to separate ice used for cooling purposes from drinking water fur-

nished train crews and passengers; to quote the section as written, "All water containers in cars shall be so constructed that ice does not come in contact with the water." This, of course, to prevent the Government certified water now required by Section 11, Standard Railway Sanitary Code, from becoming contaminated with the organisms of infectious disease contained in the melted ice water and capable of such contamination under the present system of putting ice directly into the drinking water. Circular cooling coils conducting the drinking water directly from the storage tank to the withdrawal tap have been determined to be an excellent form for such purposes, complying with the Government requirements.

On September 15, 1923, the surgeon-general of the Government health service sent out circular letters to all railways stating the general specifications for such drinking water tanks, which are briefly as follows:

"Either an underslung or an overhead storage tank (pressure or gravity system) to be filled with Government certified water, with a filing opening only large enough to admit the nozzle of the filling device used, latter to be of smooth metal and capable of protection when not in use and the filling opening guarded against insertion of filling device by screening placed a reasonable distance within the opening. Drinking water tanks to have but three openings, one for filling (this in accordance with above specification), one for withdrawal and the third for drainage and flushing operations."

Covers of water containers are required to be tight fitting, self-closing and difficult of access to unauthorized persons. It is suggested that the bottoms of ice compartments have a double flooring to prevent jar of dropping chunks of ice within and straining of joints with subsequent leakage. A door in front is suggested for icing. The material and workmanship of such tanks is to be of the best and all joints in addition to soldering should be riveted. The Government further asks that prints of tanks intended for use by the various railways and those at present being used as standard be sent to Washington for review.

Two forms of extemporized water sterilizers have been used with success, the resultant water passing state inspection and laboratory test. The first is the water obtained from the hot-water heater present in connection with every shop washroom; the second is the water obtained from the coils of a sand drier. Both of these cool the water by running through an ice coil and filtering, if necessary. A third form of extemporary sterilization is accomplished by the use of chlorinated lime mixed with water to form a standard solution, which latter is added directly to the water in the drinking tank.

The statement was made by an official of the Government Health Service that the drinking water furnished at railway stations would not at present be required to be Government certified, provided, of course, that such stations could not furnish water to trains in interstate service.

An interesting development in connection with drinking water during the past year is the question of using water from lime and soda ash treating plants. It has been found from extensive experiments at Columbus and Youngstown, Ohio, that the overtreatment of water with calcium hydroxide practically eliminates the injurious bacteria and that this treatment is quite as efficient in this respect as the chlorine treatment. No adverse physiological effects have been noted on persons drinking this overtreated water, and results strongly indicate that the complaints which are frequently made concerning water from railway water treating plants where used for drinking purposes are very much overdrawn and as far as this committee has been able to ascertain entirely without foundation.

Appendix D—The Value of Treated Water for Locomotives

It still is true that in some parts of the country water is so plentiful and so nearly pure that the boiler part of a locomotive requires almost no repair, and is good for from 12 to 20 years' service; and a first approximation to the value of treated water can be made, for any engine district with bad water, by taking the sum of the boiler repairs, the engines' loss of time while undergoing repair, the excess in fuel, and a careful estimate of the delays to traffic and the general slowing down of the service due to faulty boiler operation. Such an estimate can now be made fairly accurate for any engine district, but the results will scarcely be alike in any two.

The committee has made such estimates for a few districts in the very-bad-water country, and the results are very high, much higher than a fair average for the United States. But it also had estimates of the average, as follows:

From 1870 to 1873 the American Master Mechanics' Association was engaged in a systematic and comprehensive study of this subject; and in 1873 they reported that the average difference in boiler maintenance between bad-water and good-water country was $750 per locomotive per year, this being made up of coal (at $2.50 per ton) $340; boiler repairs, $360; and cleaning, $50. Since 1873, boilers have so increased in size, and repairs and cleaning have so increased in cost, that similar figures for today are easily $3,600; and similar measurements made within the past four years—a 10-year average difference for a large western road between engines in the mountains and engines on the plains—give an average of about $4,000.

Observations all show that where waters are only moderately hard, or in other respects vary only slightly from perfect boiler water, the damage done is mostly in fuel, boiler repairs and cleaning; and such measurements as the above apply quite well. But when the water is of a kind to cause leaking on the road, it frequently happens that the delays to traffic are of nearly as much money value as the waste of fuel and damage to the boiler. The committee has carefully compiled data from one engine district in the bad-water country where the installation of treated water is saving $5,000 per engine per year in fuel and repairs and $4,000 per engine per year in other operating expenses, a total of $9,000 per engine per year. It also has data from other districts which approximate these figures.

These districts do not represent an average for the country, but several other railroads in parts of the country with water less bad have this year commenced systematic water treating, so that we hope to be able next year to fill in our curve between these extremes.

The committee was of the opinion that the money value of the damage done to railroad revenues by the use of boiler waters only moderately unsuitable, has been much underestimated; and that the custom common to all railroads of keeping a locomotive on a bad-water district for three or four months, then transferring her for the balance of the year to a good-water district, and distributing the repair charges according to the time, has much befogged the issue.

It has checked the measurements of the water committee of 1913, which reported in Vol. 15 of the Proceedings that a boiler using water of 13 grains per gallon hardness suffered damage in fuel and boiler repairs and time lost, to the amount of 7 cents per pound of scale, and it considers them quite accurate on condition that the

amount is raised to 13 cents per pound of scale to correspond to the prices of today.

Appendix F—Automatic Control of Electrically Operated Pumps

The use of automatic control for electrically operated pumps has resulted in large saving in operating cost in many cases. If electric current is available and at a reasonable price, it is often the part of economy to replace steam-pumping plants with electrically operated pumps automatically controlled, particularly where attendants may be released. Oil engines may sometimes be replaced with economy. Automatic control is especially applicable when the pumping station is located at a distance from the storage tank, terminal, or point where the water is used. The automatic starter is easily and conveniently controlled from any remote point by means of a pilot or actuating device. An experienced attendant is not required for its operation and complete protection is afforded the motor in starting and stopping.

The selection of the type of control to be used is very seldom one of choice, but is usually fixed by certain conditions existing at the particular pumping station. The control must not only be accessible and simple to operate, but at the same time must provide protection to the motor. It should be so designed as to be impossible for attendants to touch live parts while the motor is running. The pump and motor are closely related to the automatic starter and should be carefully considered when selecting the starter. Provision should be made to properly prime the pump on starting, this feature being especially important in the operation of centrifugal outfits.

Remote control is usually by means of push button, pressure regulator or float switch. Float switches are usually used in connection with automatic starters on water tank service. Some trouble has been experienced due to ice forming and interfering with the operation of the float switch. This has been partly overcome by means of a frostproof pressure regulator operated by a column of mercury, which will stand very low temperature without trouble. A pressure regulator can be used at the pump, but consideration should be given to the difference in water level which it is desired to maintain in the tank. It is generally impractical to maintain a difference in water level of less than seven feet. This will depend somewhat upon the maximum pressure with a full tank. A pressure regulator which is built sufficiently rugged to withstand high pressure must necessarily require some power to operate and consequently a considerable difference in water level between high and low water must result.

It frequently happens that the discharge main to the storage tank is tapped at one or more points to furnish water to other facilities, such as an outlying engine house, ash pit, washout plant or water column. In such case the pressure control at the pump cannot be successfully used.

Electric motor controllers are employed to perform one or more of the following functions:

(a) Starting and stopping the motor.
(b) Regulating the motor speed.
(c) Reversing the motor.

The fundamental principles followed in the design of electric motor controllers are well known, widely used and universally accepted.

A starter is an electric controller designed for accelerating a motor to normal speed in one direction of rotation. Automatic acceleration of a motor is accomplished through the use of mechanical or electro-mechanical means. Automatic acceleration may be one of three following methods, or a combination of two of them.

Time limit acceleration is obtained usually by a solenoid or motor operated contact-making device retarded in its action. It has several contacts which are closed successively in a certain length of time. The motor is brought up to speed within this time, regardless of the current required to accelerate.

Current limit acceleration is obtained by a combination of contactors and relays, or by contactors of the series lockout type, which are so designed that the contactors will close in succession to cut out the starting resistance as the motor current rises and falls. The accelerating current is limited to a predetermined value, and the time for acceleration will vary with the load on the motor.

Counter electro-motive force acceleration is obtained by connecting the operating coils of shunt wound accelerating contactors across the motor armature. The coils are designed to close the contactors in proper sequence as the counter c. m. f. of the motor increases. The accelerating current is limited to a predetermined value and the time for acceleration will vary with the load on the motor.

Appendix I—Use of Treated Wood for Tanks

The following report is based on information received from a questionnaire sent out to many roads and covers the present general practice used in constructing tanks and frames of creosoted timber vs. untreated timber. Detail specifications for creosoting and detail method of wooden tank construction have already been reported.

Tanks in Service

For experimental purposes the Cleveland, Cincinnati, Chicago & St. Louis installed in 1907 a 25,000-gal. creosoted tank on a steel frame. It is reported that the tank is in perfect condition. It now has 70 creosoted tanks in service. The Illinois Central constructed its first creosoted tank and frame in 1916 and reports that tank is in good condition. This road now has 70 tanks in service, has constructed 15 creosoted tanks in the past year and, in addition, will construct eight additional tanks by the end of the year. This road has successfully used creosoted towers for over 20 years.

The Southern has 32 60-90,000-gal. creosoted tanks and frames now in service with six to be constructed this year. The first tub was constructed in 1917, and is in good condition. The Southern has been using creosoted frames since 1909.

The Nashville, Chattanooga & St. Louis has been using creosoted tanks for two years, has four in service and four under construction.

The Florida East Coast and the Louisville & Nashville also use creosoted tanks.

Lumber, Tub Staves and Floor Boards

From information received, it would clearly indicate that practically any sound timber that will take the creosoted treatment may be used, provided there are no defects impairing its strength and durability. Lumber should be thoroughly seasoned before treatment to prevent warping after construction of the tub or frame. The lumber most generally used is yellow pine and fir.

Most of the roads now installing creosoted tubs use a stave 3 in. thick and from 5 in. to 10 in. in width, dressed from 2¾ in. to 2⅝ in. The floor boards are of the same thickness with width ranging from 6 in. to 12 in.

Size of Tanks and Towers

The sizes of the most practical and economical creosoted tubs now being constructed are 50,000 and 100,000

gal. capacity, 16 ft. high by 24 ft. diameter, and 20 ft. high by 30 ft. diameter, respectively. The height of towers where creosoted lumber is used runs from 16 ft. to 40 ft. It appears that where a greater capacity tub is desired, or a higher frame is necessary than mentioned above, steel construction is generally used.

Framing and Treatment

It is of the utmost importance that all framing, as far as possible, be done before timber for tower or tub is creosoted. After the timber has been treated it is very difficult to properly work or frame. By cutting through the creosoted surface of the timber the benefits of the treatment are lost, especially if the untreated surfaces are exposed. Framing of the timber at the plant before treatment not only insures the maximum life of the timber but also shows considerable economy over the cost to frame in the field. Questionnaires show that trouble has been experienced by leaky tubs where framing of the staves has been attempted in the field after treatment. This is particularly true where a tub is desired smaller at the top than at the bottom. Good workmanship is vital to the life and satisfactory results are now being obtained by the use of the creosoted tubs and frames.

Both the Rueping and the full cell treatment are used by the roads now constructing tanks. The greater majority, however, use the full cell treatment using from 12 to 16 lb. of oil per cu. ft. and five to six lb. of oil in the Rueping treatment. One road reports that it uses the Rueping treatment for the tub and full cell treatment for the frame. If a road can order in advance and obtain full sap lumber thoroughly seasoned, the Rueping treatment is successfully used, but where this is not practical and sap and heart timber has to be used, partially seasoned, the full cell treatment is most satisfactory. All sawn ends or surfaces sized after treatment should receive hot creosoted oil thoroughly applied. The A.R.E.A. Specification No. 1 for creosote oil is generally used. Most of the roads have the timber framed and creosoted by outside plants and erect the tank by company forces. The Illinois Central, however, has its own creosoting plant and has for many years been creosoting its own tank tubs and frames using the full cell treatment.

Fire Risk and Conclusions

From theoretical and practical experience it may be said that creosoted material is somewhat less subject to ignition, consequently it can be regarded as a safer risk than untreated timber except for a short period after treatment.

A lower grade of lumber may be used for tanks if well treated and framed, thus overcoming the increased scarcity of suitable timber used for untreated tanks. The cost of this class of lumber plus the treatment has been found to be considerably less in cost compared with a tank constructed of untreated high grade timber. It is advantageous from a maintenance standpoint to have a tank, tower, frostproof box, all of creosoted material making the entire structure equally resistant to decay. The fact that only the metal tank fixtures, hoops lugs, etc., have to be painted is also an important factor from a maintenance standpoint.

Before a creosoted tub has had time to dry out, it would probably be objectionable for use where the water stored is to be used for drinking purposes.

A creosoted tub does not readily expand when filled with water and for this reason may call for additional attention to keep staves and floor boards from leaking. Where looks are a factor an untreated timber tub and tower well painted gives a better appearance than an unpainted treated tank.

While the committee has no definite date as to the maximum life of a creosoted tank and tower, it does know that there are timbers over 20 years old still in good condition and tubs still in service which were constructed in the past 16 years. This information coupled with the fact that creosoted lumber has proven satisfactory for many other purposes, would lead one to conclude that the creosoted tub and tower would last at least as long if not longer than the best untreated timber tank.

Discussion

C. R. Knowles (Chairman): The first subject, revision of the Manual, merely involves certain changes in the diction of definitions; no change in the principle or recommended practice is involved.

Vice President Ray (in the chair): Is there any objection to the recommendation of the committee in regard to the changes in the Manual? If not, they will stand.

Mr. Knowles: The second subject is Regulations of Federal or State Health Authorities pertaining to drinking water supply. The opening paragraph of this report calls attention to the ruling requiring that all railroads separate ice used for cooling purposes from drinking water furnished train crews and passengers on or before July 1, 1924. The committee had no part in formulating this order; it is simply offered as a matter of information.

Dr. S. C. Beach (I. C.): This law states that water containers in newly constructed cars and those newly installed in stations shall be so constructed. This gives us the opportunity to make this change gradually and not as one tremendous, sweeping change, involving considerable expense.

D. A. Steel (*Railway Age*): I feel that attention should be called to what I consider a discrepancy in the last paragraph of this report. The statement is entirely misleading. It says, in effect, that lime has a purifying quality upon water from the standpoint of killing bacteria, as based upon experiments conducted at the treating plants in Youngstown, Ohio and Columbus.

We ought not to give much credence to tests made outside of railway installations owing to the lack of observation conducted by railway officers themselves over the experiments which have given rise to the conclusions drawn at those points.

Furthermore, I am certain that the results of analyses made of treated water obtained from many treating plants in railway service are directly contrary to the statements made here, that no adverse physiological effects are to be noted on persons drinking the treated water. It may be true that under ideal conditions the treatment of water with lime improves it from the standpoint of its sanitary character, but under the conditions that railways operate a great many of their water treating plants and the lack of supervision that is associated with their operation as compared with the supervision under which municipal filtration plants are operated, I don't think that we can say, without conducting more elaborate experiments in the railway field itself, that treated water is not subject to complaints from men who have been drinking it.

I recall tests made on treated water by state health boards that showed a condition of the treated water itself, from a sanitary standpoint, which resulted in the condemnation of those particular supplies for drinking purposes. The question of adverse physiological effects is not one of bacteria content alone as there are other

conditions which may result in adverse effects. It has been demonstrated that slight changes in the chemical character of water for persons who are not accustomed to drinking that water may also result in ill effects.

Further investigations should be conducted within the railway field before this Association should give much credence to experiments conducted outside of the field.

Mr. Knowles: It was not the intent of the committee to recommend the lime treatment for the removal of bacteria. In so far as the bacteria in the water and the condition of the water from a sanitary standpoint is concerned, the railroads have a little control over the methods to be followed in securing that ideal condition.

What Mr. Steel says so far as to the possible effects on the human system of water treated with lime and soda ash would probably be very true of one in a weakened condition. I don't think a man in such a condition that ordinary treated water would have a bad physiological effect upon him, would be where he could have access to the water.

Dr. Beach: May I call attention to the fact that these points were very clearly brought out by Hoover of Columbus, and that chemistry, whether intrarailway or inter-railway remains the same. Physiological effects are the same. With regard to the physiological condition with lowered resistance, the effect will differ on different people, but the point is this, with reference to number of bacteria which we are allowed by the government, we find that lime has a very decided bactericidal effect.

Mr. Knowles: This committee has been making a study of pitting and corrosion for the past three years, endeavoring to find corrective measures that will overcome pitting and corrosion in locomotive boilers. The progress has necessarily been slow, as the problem is a difficult one. The work during the past year has been largely confined to the study of the effect of the composition of boiler tubes on the rate of corrosion, particularly those containing copper.

(In the absence of Dr. McDonald, the chairman of the committee, R. C. Bardwell, submitted the report.)

R. C. Bardwell (C. & O.): The report submitted deals largely with an explanation of what is meant by hydrogen ion concentration. It is generally recognized that acid water will cause pitting. There are some waters which have acid tendencies which do not react to the common methods ordinarily used in laboratories and rough test sets. This can be determined with a great deal more accuracy by determination of the hydrogen ion content. As this is a subject which comes up frequently in the discussion of pitting and corrosion, it was thought that it might be well to include an explanation of hydrogen ion determination in this report so that the members may get some idea of what the chemists were talking about.

(The report was received as information).

Mr. Knowles: The next item is appendix D, Value of Water Treatment for Locomotives. The committee hopes eventually to arrive at some definite basis whereby the value of treated water may be definitely shown in dollars and cents.

Maurice Coburn: The committee should attempt to make some distinction between the different kinds of scale and other impurities; as an instance, the sulphates which make the hard scale are supposed to have about three times the insulating value of the lime scales and the hard scale binds the soft scale, and we know it does a great deal more damage.

J. L. Campbell (E. P. & S. W.): This is a very important subject, the value of treated water for locomotives. Referring to an experience we had on the El Paso and Southwestern: Prior to 1918, on one engine district of the Eastern district, covering about 128 miles, the only source of water supply was from deep wells. All of the water was exceedingly bad, the incrusting solids running as high as 150 grains per gallon, so we treated the water with lime and soda ash. By the time we had reduced the resistants to 50 grains per gallon it would not stay in the locomotive boiler. We secured a supply of water from the mountains which had about five grains of incrusting solids. This water was conducted to and along the railroad by 140 miles of pipeline. We invested something over a million dollars, but within 18 months the change in the operating revenue on that district attributable to the introduction of this new water supply repaid every dollar that was invested. This, of course, is an extreme case, but as railroads go into this subject they will find that it will be advantageous to treat water that they are now using and which they think is very good water, giving comparatively little trouble.

Mr. Knowles: I would like to refer to the figure of seven cents per pound of solids removed as the saving arrived at by the committee of 1913. The committee has endeavored to adjust those figures to existing prices and has arrived at a figure of 13 cents per pound for scale removed. I think you will find those safe figures to use.

Mr. Coburn: I want to call attention to the fact that those figures do not include the cost of delays to traffic. The subject of the losses is so intangible that it is very hard to get the ordinary operating man or engineer to appreciate the importance of it. In most places we need more education.

(The report was received as information).

R. C. Bardwell (C. & O.) (chairman of the sub-committee on Standard Methods of Water Analysis): It has long been felt that there is considerable need for more uniform practice in the methods of analyses of water supplies for boiler purposes and especially in the methods of expressing those analyses after they are made. The sub-committee last year submitted a tentative report on this subject with requests that suggestions or criticisms by the members be referred to the committee during the year, and the methods were again gone over very thoroughly at committee meetings. *I move its adoption for publication in the Manual.*

(The motion was carried.)

F. D. Yeaton (C. M. & St. P.) (chairman of the sub-committee on the Automatic Control of Pumps): When the committee first took up this subject it was thought that we could describe in detail an automatic control for electrically operated pumps. We soon found that there were many firms manufacturing automatic controls and there were many designs.

(Mr. Yeaton then pointed out the more important parts of the report, after which it was accepted as information. The report on Substitutes for Joints in Cast Iron Pipe was accepted as a progress report.)

Mr. Knowles, (referring to the report on Methods of Watering and Showering Hogs in Transit): Heavy loss is sustained in shipping hogs, through overheating; this has been a matter of concern to railroads and shippers alike. The committee has endeavored to submit information as to the methods to be used in showering hogs as well as other information that may be of assistance in the solution of the problem. The committee made an exhaustive study of this subject and had secured prints of the various devices in use on the railroads of the country and has submitted a plan of what is considered to be the best device for this purpose. It is a combination

of the various devices used and differs but slightly from those used by a number of railroads throughout the Middle West.

(The report was received as information.)

Mr. Knowles: The next and final report is on the use of treated wood for water tanks. In presenting this report, the committee has endeavored to outline the present general practice in the construction of tanks and towers of creosoted timber with a discussion on the relative merits and existing specifications for treated tanks of this description.

Mr. Knowles: Let me correct my former statement on that. I have submitted the report as information. *I move that the conclusions be included in the Manual; the remainder of the report to be received as information.*

(The motion was carried.)

Report on Economics of Railway Location

The work of the Committee on Economics of Railway Location has been concerned chiefly with the making of scientific studies and analyses of conditions affecting railway operation. This year the committee submitted a report on the relative merits of increasing tonnage by reducing ruling grades and by the use of more powerful locomotives. In this report, consideration was given to the question of momentum grades and the availability of locomotive boosters. Many roads have apparently developed definite policies favoring either heavier power or grade reduction. The reasons for the adoption of these policies if analyzed and compared, may lead to principles of great value. E. E. King, the new chairman, has been a member of the Committee on Economics of Railway Location for two years.

E. E. King
Chairman

IN APPENDIX A, THE COMMITTEE presented a progress report on the relative merits of increasing tonnage by reducing ruling grades or by the use of more powerful locomotives, including a consideration of momentum grades and the availability of the locomotive booster.

Substantial progress was reported on the collection of information on the economics of railway location as affected by the introduction of electric locomotives and on units for comparing cost of maintenance of way, equipment and transportation.

Committee: E. E. King (Univ. of Ill.), chairman; H. C. Searls (M. P.), vice-chairman; John C. Beye (I. C. C.), S. J. Buckalew, H. R. Carpenter* (M. P.), I. A. Cottingham, (Con. Engr.), A. S. Cutler (Univ. of Minn.), A. S. Going (C. N. R.), C. P. Howard (I. C. C.), Fred Lavis (Con. Engr.), Frank Lee (C. P. R.), E. W. Metcalf (M. K. T.), J. S. Robinson (C. & N. W.), J. R. Schick (N. & W.), E. C. Schmidt (Univ. of Ill.), A. K. Shurtleff (A. R. E. A.), C. W. Stark (U. S. C. of C.), R. H. Washburn (C. & A.), Walter Loring Webb (Con. Engr.), M. A. Zook (Con. Engr.).

*Deceased.

Appendix A—Relative Merits of Increasing Tonnage by Reducing Ruling Grades, or by the Use of More Powerful Locomotives, Including Consideration of Momentum Grades, and the Availability of the Locomotive Booster

A definite procedure has long been in use for testing the economic justification for contemplated grade reduction *per se*. Such a procedure has been recommended by this committee, approved by the Association and incorporated in the Manual. Presumably, all of the numerous grade reductions that have been carried out in the last generation have been tested out in this manner.

Meanwhile, the constant necessity for increased capacity has resulted in larger and larger locomotives for the existing grades. In general, they are fully justified by the fact that they have been and are now hauling a volume of traffic that the railroads could not otherwise handle. Whether they have tended to increase or decrease the operating ratio is not susceptible of easy analysis, involving as they have, increased capital charges in the structures to carry them and increased repairs to equipment to set against decreased train-mileage per ton-mile. The assignment of this committee is the complex one of attempting to establish a basis of comparison between these two methods of increasing tonnage, to determine not only whether either is economically justified, but also which is preferable. Consideration in the study is to be given to momentum grades, and the availability of the locomotive booster.

Grade reductions are permanent improvements. When they are completed and charged to capital account they do not involve any increased expenses for maintenance of way and structures. In fact, they usually result in a decrease in such expenses after the seasoning period, because in their construction they afford the railroad the opportunity, usually taken advantage of, of eliminating grade crossings, replacing wooden and steel bridges with concrete structures or solid embankments, and following the latest approved practices in such important matters as drainage. They do not affect maintenance of equipment, inasmuch as no change in power is required and there is no increase in the train resistance, although more cars are hauled per train.

Grade reductions require considerable periods to construct, during which time operation on the old line may be greatly hampered by the construction operations. They also serve only limited parts of the railroad systems. In the case of some of the older systems formed by linking up short lines built without regard for the needs of through traffic, grade-reduction programs under way for

many years still leave the systems with sections of ruling grade out of harmony with the systems as a whole.

Heavier power is immediate in its results and is flexible. It can be ordered in one, 10 or 100 units as the situation requires, and these units can be shifted to any division whose bridges and roadbed will sustain them, replacing or supplementing overnight the lighter power in use.

Before the heavier units can be used, however, there may be necessary a reconstruction period comparable in length to that required for a grade reduction, to bring the bridges and roadway up to the weight capacity to carry the heavier units; to provide longer stalls in engine houses, longer turntables and ashpits, additional shop machinery and more powerful cranes to serve and facilitate repairs to the larger units; to lengthen sidings and yard tracks to hold the longer trains they will haul. All of these items are capital charges and must be taken into account in an economic comparison with the alternative of a grade reduction.

Since the heavier locomotive hauls a longer train by exerting a greater tractive effort and overcoming a greater train resistance, the forward cars of the train must sustain that resistance, and obviously the cars must be stronger or the repair bills will mount. In the natural order of events the building of stronger cars and the strengthening of old ones has been going on as long as we have had railroads. But inasmuch as there is always a large percentage of cars not yet brought up to recent strength standards, and these cars move throughout the country in interchange business, they are inevitably subjected to the large resistances imposed by the heavy locomotives. While the committee had no data on this point, it believed that heavy power has added materially to the cost of maintenance of equipment per ton-mile. It believed that such power has also added to the cost per ton-mile of maintenance of way and structures. Other elements to be considered are the relative capital charges and amounts of depreciation per pound of tractive power of heavy locomotives and lighter ones. The committee would welcome figures from individual railroads on all of these matters.

From the standpoint that each locomotive in freight-line haul should be working at all times to substantially its full capacity, grade reductions, which tend to make the train resistance uniform throughout the division, seem sounder in principle than the introduction of heavier locomotives, which by main strength haul longer trains over the limiting grades, but on the rest of the division are working to no higher percentage of their capacity than the lighter locomotives.

The time element, however, is an important consideration. If the limiting grade occurs only at a few points, the locomotive will have surplus power elsewhere to accelerate the train, and may be able to get the train over the division without overtime, whereas with a uniform grade and the locomotive loaded to capacity it may be impossible to make necessary speed. A division might have one five-mile grade up which a locomotive could haul at five miles per hour, the train it would haul the rest of the distance at 15. Reducing this grade to the average of the others would cut the running time for the same train but 40 minutes, and the possible increase in train tonnage without increased running time would be slight.

The time element is especially serious because so many division points and engine runs have been located with a view to a longer working day than the present standard. Any additional overtime involved in grade reductions which utilize the full capacity of the locomotive should be weighed against the saving in train-mile per ton-mile.

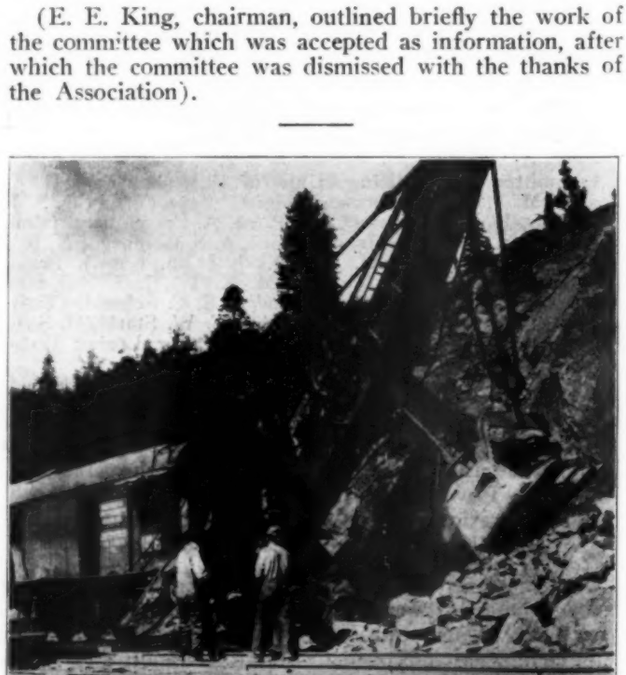
The possibilities of momentum grades and pusher grades are set forth in the Manual. Locomotive boosters built either as small steam engines geared to an axle of the trailing truck or as small four-wheel tractors that may replace either or both of the tender trucks in order to utilize these additional wheel-loads to add to the adhesion and tractive effort of the locomotive, appear to occupy a position somewhat intermediate to the momentum grade and the pusher grade. Tests made last year by the Delaware & Hudson indicate that the booster has its chief use in assisting in accelerating or surmounting short ruling grades, where it is impossible or unsafe to depend on momentum and where the use of pushers is economically unjustified. The booster is designed to operate only at low locomotive speeds, and cannot be regarded as a substitute for a heavier locomotive for general road work.

Momentum grades, pusher grades and the use of the booster are all factors to be considered in a contemplated grade reduction. Grade reductions are not necessarily alternatives to the introduction of heavier power; they may well supplement and complement each other.

The committee had not asked individual railroads for data, by questionnaire, or otherwise. It attempted rather in the first report on a new subject merely to set forth some of the elements in its problem, in the hope that discussion at the meeting of the Association may guide it as to the relative importance of these and other elements and the best method of attack. The problem is one that involves large expenditures of money. Obviously each specific case must be decided by analysis of the greatest return per dollar invested. Certain railroads, however, have apparently arrived at a definite policy in favor of heavier power, others at one in favor of grade reductions. The reasons for these policies, if analyzed and compared, might lead to basic principles of great value. The committee believed the subject is one deserving careful consideration.

Discussion

(E. E. King, chairman, outlined briefly the work of the committee which was accepted as information, after which the committee was dismissed with the thanks of the Association).



Steam Shovel Work on Southern Pacific Double Tracking in Nevada

What the Roads Have Done with Train Control

Contracts for Installations Closed on Fifteen Roads, While Tests Are Being Made on Nineteen Others

ALTHOUGH ONLY 10 months remain for the completion of automatic train control on approximately 5,500 miles of road to comply with the Interstate Commerce Commission's order No. 13,413, only one road, the Chicago, Rock Island & Pacific, has received approval of its complete installation. In addition, the Chicago & Eastern Illinois, with 108 locomotives equipped and 105.4 miles of train control in service, is at this time making minor changes in the locomotive equipment and is thus practically in a position to meet the requirements of the order, while the Chesapeake & Ohio has 61 miles of train control in service, with 64 road locomotives.

These three roads are the pioneers in the permanent installation of train control and can hardly be considered as typical of the general condition on the other roads. Thus, among the remaining 46 roads mentioned in the order only 15 roads have definitely announced that contracts have been closed for the installation of train control over an entire engine district as required. Typical of these are the Norfolk & Western, the Atchison, Topeka & Santa Fe, and the Philadelphia & Reading, which have chosen the Union Switch & Signal Company's three-speed continuous induction device. On the Santa Fe, approximately 50 per cent of the wayside apparatus has been installed and seven locomotives are now being equipped. The Delaware, Lackawanna & Western and the Louisville & Nashville have contracted for the two-speed continuous device as manufactured by the same company. The Chicago, Indianapolis & Louisville has contracted for a 98 mile single track installation of the Sprague intermittent induction type of train control between Hammond, Ind., and Lafayette. The Southern Pacific reports that the National Safety Appliance Company's intermittent inductive device is to be installed on 75 miles of road between Oakland, Cal., and Tracy. The Galveston, Harrisburg & San Antonio has contracted for a 50.6 mile installation of the same type between Rosenberg, Tex. and Glidden.

The New York Central Lines have let contracts for materials for the construction of automatic train control apparatus for their five roads named in the first order of the I. C. C., namely: Boston & Albany, between Springfield, Mass., and Albany, N. Y.; Michigan Central, between Detroit, Mich., and Jackson; Big Four, between Indianapolis, Ind., and Mattoon, Ill.; Pittsburgh & Lake Erie, between Pittsburgh, Pa., and Youngstown, Ohio, and the New York Central between Albany, N. Y., and Syracuse. Contracts have been let for the first three named roads to the General Railway Signal Company, the fourth to the Union Switch & Signal Company, and the fifth to the Sprague Safety Control & Signal Corporation. The installation will be done by railroad company forces.

Test Installations

Sixteen railroads report road tests of train control devices. Perhaps the most extensive test installation made is that put in service by the Pennsylvania Railroad on 51 miles of road between Sunbury, Pa., and Lewiston. This installation uses the Union Switch & Signal Company's three-speed continuous induction system. Twenty locomotives have been fitted up with the engine equipment. The New York, New Haven & Hartford has in service a 10-mile test installation of the Union Switch & Signal Company's three-speed continuous induction apparatus between Cedar Hill, Conn., and Wallingford, with one locomotive equipped.

A test installation of the intermittent induction system as developed by the National Safety Appliance Company has been in service on 5 miles of single track on the St. Louis-San Francisco between Nichols Junction, Mo., and Brookline since June, 1923, on which there are 8 locomotives now equipped. This same system of train control is being tested on the Chicago & Alton, which has made an installation on 14 miles of double track near Bloomington, Ill. There are 4 locomotives equipped and operating over this territory.

The Chicago & North Western has been conducting a road test on the General Railway Signal Company's intermittent induction train control system, with tapered speed control. This test installation is in service between West Chicago, Ill., and Elgin, a distance of 16 miles. The Buffalo, Rochester & Pittsburgh has also been testing the General Railway Signal Company's intermittent induction system, with the tapered speed control on 16 miles of road. Four locomotives are equipped for test purposes. The Baltimore & Ohio has made a test installation of the General Railway Signal Company's intermittent inductive system. This installation consists of three magnet groups and one locomotive equipped with the engine device.

The Chicago, Burlington & Quincy put in a test installation on 8 miles of road, using the Federal Signal Company's continuous type of train control. One engine was equipped and the material for an additional locomotive is practically completed. The Delaware & Hudson has been making a test of the Federal Signal Company's system using one locomotive over 3.5 miles of road.

The Union Pacific has in service a test installation including three systems, the Union, the Miller and the National. One locomotive is equipped with the three devices, the wayside equipment of the systems being installed on different track sections.

Numerous road tests for short periods of time have been made by several roads among which is the Great Northern test of the Miller and the National systems. The Cleveland, Cincinnati, Chicago & St. Louis has made tests of the Indiana Equipment Company's device, while the Webb, and the Train Control Corporation of America (Clifford) devices are under test on the Erie railroad. Numerous other tests not mentioned in this article have been made. However, the list as shown in the accompanying table includes those installations and tests as reported by the railroads to the Commission.

On January 14, the Interstate Commerce Commission added to its original train control order a list of 45 additional railroads requiring that these roads make installations of automatic train control over one passenger locomotive division between specified limits. Forty-seven of the original 49 railroads were also ordered to make further installations over another passenger locomotive division in addition to the first division ordered to be installed on June 13, 1922. The railroads have asked for a rehearing on train control and asked that the second order be annulled. Inasmuch as the second order has been of such recent date the new roads have not had the opportunity as yet to decide definitely what is to be

STATUS OF TRAIN CONTROL INSTALLATIONS UNDER ORDER OF JUNE, 1922

Railroad	Miles of Road Operated by System x	Number of Locomotives on System y	Present Signaling in Territory Selected		Average Number of Trains Each Way Daily	Installation Under First Order to Include									Test Installations	
						Selected Territory Covers					Locomotives To Be Equipped		Train Control Selected	Type of Train Control		
			Miles of Track Equipped with Automatics	Number of Interlockings		From	To	Miles of Road: Single	Miles of Road: Double	Miles of Track	Passenger	Freight			Train Control	Miles
A. T. & S. F.	8,966	2,159		6	30	Chicago, Ill.	Shopton, Iowa		234.6	469.2	41	84	U. S. & S.	Induction		
A. C. L.	4,858	881	229.6			Acca, Va.	So. Rocky Mt., N.C.		114.6	229.3	13	20, 11Y			G. R. S.	14
B. & O.	5,212	2,558	72.6	5	50	Baltimore, Md.	Washington, D. C.		36.3	72.6	34	95			G. R. S.	9
*B. & A.	394	360	202			Albany, N. Y.	Springfield		101	202	41 (11 P. & F.)	95	G. R. S.			
*B. & M.	2,512	1,134	211.2			Boston	Greenfield		105.6	211.2	40	93			U. S. & S.	13.7
B. R. & P.	590	290	106	1	25	Rochester, N. Y.	Ashford	82	12	106	14	79			G. R. S.	15
C. R. R. of N. J.	685	573	27.7		30	Red Bank, N. J.	Winslow Jct.	65.9		65.9	37 (48 P. & F.)	5				
*C. & O.	2,558	947	61	2		Gordonville	Staunton	61		61	29	35	American	Ramp		
C. & A.	1,052	341	227.6	12	26	Chicago, Ill.	Bloomington	51.2	101	253.2	14	32			National	14
C. & E. I.	945	347	210.8	17	30	Yard Center, Ill.	Danville		105.4	210.8	57	50	Miller	Ramp		
*C. & E.			253.2			Marion, Ohio	Huntington, Ind.		126.6	253.2	6	24 E.J.& E. 42				
C. & N. W.	8,462	2,092	298	2	20	Boone, Iowa	Council Bluffs		149	298	62	60			G.R.S.	16
*C. B. & Q.	9,393	1,929	171.1	6		Creston, Iowa	Omaha, Neb	44.3	63.4	171.1	12 (11 P. & F.)	32			Federal	12
*C. I. & L.	654	158	84	3		Hammond, Ind.	La Fayette, Ind.	97		97	15	15	Sprague	Induction	Sprague	10
*C. M. & St. P.	10,601	2,034	215.6	6		Bridge Switch	Hastings		108.1	215.6	21	29				
C. R. I. & P.	8,123	1,633	330.8	9	24	Blue Island, Ill.	Rock Island	165.4	165.4	330.8	39	63	Regan	Ramp		
C. St. P. M. & O.	1,749	396	235		8-12	St. James, Minn.	Le Mars, Iowa	122.6		122.6	30	73				
*C. C. C. & St. L.	2,407	898	114			Indianapolis	Mattoon	56.3	72	200	22	48	G. R. S.			
*D. & H.	873	490	113			Whitehall	Rouses Point	113		113	12	51			Federal	
D. L. & W.	981	762	292		25	Elmira	Buffalo		146	292	10	65	U. S. & S.	Induction		
*Erie	2,447	1,549	208.4			Port Jervis	Susquehanna		104.2	208.4	12	64			Webb / Clifford	
G. H. & S. A.	1,400	326	210		12	San Antonio	Houston	200	10	220	58	91	National			51
G. N.	8,266	1,423	121		9	Minot, N. D.	Williston	121		121	8	26			Miller / National	
I. C.	4,799	1,672	249.4		29	Champaign	Centralia		124.7	249.4	11	46	U. S. & S.	Induction		
*K. C. S.	836	183		7		Grandview, Kan.	Pittsburgh	104		104	11	36				
*L. V.	1,335	1,019				Newark, N. J.	Easton, Pa.	24.8	6.2	168.4	30	120	G. R. S.	Induction		
L. I.	395	165	5	3	59	Long Island	Port Washington	10	9.5	29		4				
L. & N.	5,039	1,306	165		25	Corbin, Ky.	Etowah	165		165	9	22	U. S. & S.	Induction		
*M. C.	1,862	806	158			Detroit	Jackson		79	158	22	28	G. R. S.			
*Mo. P.	7,179	1,169		5		Kansas City	Council Grove	146		146	6	12	National			13.9
*N. Y. C.	5,710	3,467	578.69			Albany	Syracuse		10.5 / 138 F	581.8	104	216	Sprague	Induction		
*N. Y. C. & St. L.	523	285	124	2	18	Chicago	Ft. Wayne	128.4	14.2	156.8	7	29	U. S. & S.	Induction		
*N. Y. N. H. & H.	1,948	1,236				Air Line Jct.	Springfield		62	124	66 P. & F.				U. S. & S. / G. R. S.	10.5
N. & W.	2,238	1,097			10	Shenandoah, Va.	Hagerstown, Md.	107		107	10	40	U. S. & S.	Induction		
N. P.	6,656	1,439	109.3		13	Mandan, N. D.	Dickinson	109.3		109.3	9	20				
*O. W. R. & N.	2,238	314	84	1		East Portland	The Dalles	84		84	8	12				
Penna.	10,534	7,447	14.5	21	49	Baltimore	Harrisburg	0.19	83.01	166.2	64	123			U. S. & S.	50
P. C. C. & St. L.			35.53			Indianapolis	Columbus	53.5	134	345.5	25	114				
W. J. & S. S.			116.8	9	78	Camden, N. J.	Atlantic City		58.4	116.8	102	44				
P. & R.	1,127	1,095	111		65	Camden	Atlantic City		55.5	111	41	9	U. S. & S.	Induction		
*P. & L. E.	231	324	223.9	14		Pittsburgh	Youngstown		18.87 / 46.9 T	223.9	20	50	U. S. & S.	Induction		
*P. M.	2,213	448		4		Alex, Ohio	Romulus, Mich.	37		37	18	47	U. S. & S.	Induction		
*R. F. & P.	119	91	203.2	7		Richmond	A. F. Tower		101.6	203.2	53	2				
*St. L.-S. F.	4,769	937	47.7			Springfield	Sapulpa	195.2	4	203.2	20	40			National	
*S. P.	7,117	1,499	99			Oakland	Tracy	51	24	99	45	25	National			
*Southern	8,310	2,212	306	1		Spencer, N. C.	Greenville, S. C.		153	306	22	37				
C. N. O. & T. P.				22		Ludlow, Ky.	Somerset	78	78.5	235	14	66			G. R. S.	35.2
*U. P.	3,709	1,008		7		Sydney, Neb.	Cheyenne, Wyo.		102	204	40	60			National / Union / Miller	
*W. M.	702	302	80			Elkins, W. Va.	Thomas	35.1		35.1	2	12				

*As reported to the I. C. C.
x, y; As given in official pocket list.

done on their lines as it will be necessary for each railroad to study the local traffic conditions peculiar to itself. For this reason the information given in this article is based largely upon the 49 roads included in the original order.

American Railway Engineering Association Registration

THE REGISTRATION of members and guests of the American Railway Engineering Association yesterday totaled 708, including 584 members and 124 guests. This is the largest attendance recorded at the first day of any convention in the history of the association, the previous high record being 666 for the convention of 1922. The registration follows:

Abbott, R. B., asst. gen. supt., P. & R., Reading, Pa.
Ackerman, F. J., sig. engr., K. C. T., Kansas City, Mo.
Adams, Lem, rdwy. asst., president's staff, U. P., Omaha, Neb.
Adams, L. L., rdmstr., L. & N., Etowah, Tenn.
Albright, C. C., prof. ry. civil engr., Purdue Univ., Lafayette, Ind.
Ames, Azel, cons. engr., 30 Church St., New York City.
Amory, G. G., engr. dept., C. & W. I., Chicago.
Amoss, F. X., 514 Notre Dame Invest. bldg., Winnipeg, Man., Can.
Anderson, B. T., supt. signals, B. & O., Richmond, Va.
Anderson, C. H., asst. engr. of bldgs., Chicago.
Anderson, Irving, div. engr., A., T. & S. F., Marceline, Mo.
Angerer, Victor, vice-pres., Wm. Wharton, Jr., & Co., Easton, Pa.
Arbuckle, N. L., asst. engr. M. of W., C. C. C. & S. L., Indianapolis, Ind.
Armistead, F. W., asst. engr., I. C., Chicago.
Armour, Robert, masonry engr., Canadian Nat'l, Toronto, Ont., Can.
Armstrong, H. J., asso. prof. civ. engrg., Armour Institute, Chicago.
Atwill, A. Lee, asst. engr., C. & W. I., Chicago.
Austill, H., bridge engr., M. & O., St. Louis, Mo.
Badger, O. C., asst. engr., A., T. & S. F., Chicago.
Bainbridge, C. N., engr. of design, C., M. & St. P., Chicago.
Baker, J. B., engr. M. of W., Penn. Sys., Harrisburg, Pa.
Baker, W. E., supervisor, Penn. Sys., Youngwood, Pa.
Bakhshi, S. R., asst. engr., C. B. & Q., Chicago.
Baldridge, C. W., asst. engr., A., T. & S. F., Chicago.
Baldwin, Hadley, asst. to gen. mgr., C. C. C. & St. L., Cincinnati, Ohio.
Ballard, E. E., engr., St. Louis Frog & Switch Co., St. Louis, Mo.
Balkwill, S., pres. Balkwill Manganese Crossing Co., Cleveland, O.
Baluss, F. C., engr. bridges and bldgs., D., M. & N., Duluth, Minn.
Banks, T. G., dist. engr., M. K. & T., Oklahoma City, Okla.
Bardwell, R. C., supt. water supply, C. & O., Huntington, W. Va.
Barrett, P. T., office engr., C. & W. I., Chicago.
Barrett, W. C., trnmstr., L. V., Sayre, Pa.
Bartlett, Calvin, supvr., of land appraisals, Wabash, St. Louis, Mo.
Batchelder, F. L., ch. engr., Copper Range, Houghton, Mich.
Batchellor, F. D., div. engr., B. & O., Garrett, Ind.
Bates, Onward, civil engr., 332 S. Michigan Ave., Chicago.
Beach, D. P., div. engr., Penn. Sys., Indianapolis, Ind.
Beach, Dr. S. C., health officer, I. C., Chicago.
Beckett, F. T., engr. M. of W., C. R. I. & P., El Reno, Okla.
Belcher, R. S., mgr. treating plants, A. T. & S. F., Topeka, Kans.
Bell, Gilbert J., engr. Eastern dist., A., T. & S, F.. Topeka, Kan.
Bernhardt, J. E., bridge engr., C. & E. I., Chicago.
Bertram, H. A., asst. div. engr., C. & O. Ry. of Ind., Peru, Ind.
Bieth, R. J., div. engr., N. Y. N. H. & H., Waterbury, Conn.
Bishop, F. J., asst. ch. engr., A. A., Owosso, Mich.
Blackman, Chas. H., prin. asst. engr., L. & N., Louisville, Ky.
Blaess, A. F., engr. maint. of way, I. C., Chicago.
Blanchard, A. M., pilot engr., valuation dept., Canadian Nat'l, Toronto, Can.
Blum, Bernard, engr. m. of w., Nor. Pac., St. Paul, Minn.
Bolin, W. C., pilot engr., B. & O., Baltimore, Md.
Bond, F. L. C., ch. engr., Cent. Reg., Canadian Nat'l, Toronto, Ont., Can.
Boots, E. W., engr. maint. of way, P. & L. E., Pittsburgh, Pa.
Boughton, V. T., asst. editor, Engineering-News Record, New York City.
Bousfield, J. C., asst. engr., Wabash, Springfield, Ill.
Bowser, E. H., supt. timbr dept., I. C., Memphis, Tenn.
Boyce, W. S., care Railroad Supply Co., 203 S. Dearborn St., Chicago.
Boyd, G. E., Railway Review, Roseville, Ill.
Bradley, A. C., div. engr., C. R. I. & P., Trenton, Mo.
Brady, S. W., div. engr., G. C. & S. F., Beaumont, Tex.
Brameld, W. H., engineering assistant to operating vice-pres., Erie, New York City.
Bremner, Geo. H. (treasurer), engineering department, C. B. & Q., Chicago.
Briggs, Z. M., asst. engr., Penna., Pittsburgh, Pa.
Brooke, G. D., supt. Transportation, B. & O., Western Lines, Cincinnati, Ohio.
Brooke, Richard, div. engr., B. & O., Weston, W. Va.
Brousseau, L., distr. engr., Can. Nat., Quebec, Canada.
Brown, A. V., engr. m. of w., Lake Shore Electric, Sandusky, O.
Brown, G. H., asst. ch. engr. m. of w., Penna., Philadelphia, Pa.
Brown, H. C., Jr., Chicago Bridge & Iron Works, Room 1919, 30 Church St, New York City
Brown, J. M., asst. to vice-pres., C. R. I. & P., Chicago.
Brown, W. G., engr. m. of w., F. E. C., St. Augustine, Fla.
Brown, W. P., consulting engr., Cleveland, Ohio.
Brumley, D. J., ch. engr., Chicago Terminal Improvements, I. C., Chicago.
Brunner, John, assistant insp. engr., Illinois Steel Company, Chicago.
Bryan, C. G., asst. engr., I. C., Chicago.
Buck, J. A., Supervisor, Wabash, Montpelier, Ohio.
Buehler, Walter, asst. sales mgr., The Barrett Company, New York City.
Burpee, Moses, ch. engr., B. & A., Houlton, Me.
Burrage, W. H., pilot, Valuation Dept., N. Y. C. & St. L., East Cleveland, Ohio.
Burrell, C. F., engr. M. of W., K. & I. Term., Louisville, Ky.
Burt, A. M., asst. to vice-pres. Operation, Nor. Pac., St. Paul, Minn.
Burton, W. J., asst. valuation engr., Mo. Pac., St. Louis, Mo.
Busch, Harry F., div. engr., St. L.-S. F., Fort Scott, Kan.
Butler, E. S., asst. valuation engr., M. K. & T., Parsons, Kan.
Butterworth, A. S., ch. engr., M. S. B. & P., Pensacola, Fla.
Campbell, J. L. (past-president), ch. engr., El P. & S. W., El Paso, Tex.
Carothers, J. B., supt., B. & O., Western Lines, Chillicothe, O.
Carrick, O. W., water engr., Wabash, Decatur, Ill.
Carroll, G. A., div. engr., C. R. I. & P., Kansas City, Mo.
Carver, A. R., div. engr., B. & O., Newark, Ohio.
Cassil, H. A., ch. engr., P. M., Detroit, Mich.
Cast, W. D., val. engr., K. C. Term., Kansas City, Mo.
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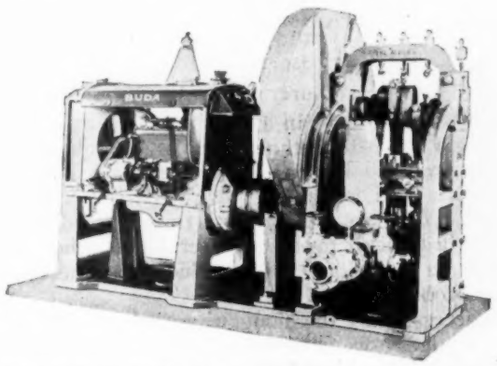
Motorized Railway Equipment

WHILE THE GAS ENGINE has been a reorganized form of power unit for years, it is being adapted to a constantly increasing variety of uses. A recent development of this character has been made by the Buda Company, Harvey, Ill., which has adapted its heavy duty engine, which it has built for standard equipment for mounting on trucks for a wide variety of work, as an independent self-contained power unit. This

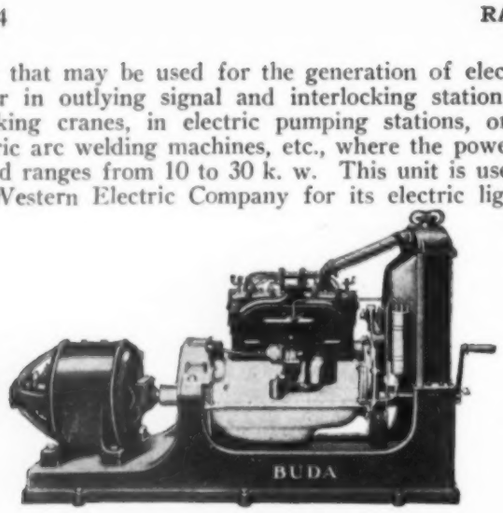


The Unit Power Plant Connected to a Triplex Pump

unit contains a standard Buda four-cylinder heavy duty engine. In its new form it is adapted for the operation of turntables, track laying machines, portable and stationary pumps, hoists, air compressors, excavators, post hole diggers and a wide variety of other work.

One of the illustrations shows it connected to a 5½-in. by 7-in. triplex pump for supplying water to roadside water tanks. The capacity of this installation is indicated by the fact that it can maintain two ⅞-in. fire streams at 150 lb. pressure. The other illustration shows the application of this power unit to electrical equip-

ment that may be used for the generation of electrical power in outlying signal and interlocking stations, on wrecking cranes, in electric pumping stations, or for electric arc welding machines, etc., where the power required ranges from 10 to 30 k. w. This unit is used by the Western Electric Company for its electric lighting



Connected to An Electrical Unit

and power units, by the Lidgerwood Company for hoists for various purposes, etc. Typical of its application by the railways is its installation in a coaling station of the Louisville, Henderson & St. Louis at Owensboro, Ky., where service records showed a gasoline consumption of seven gallons to elevate 100 tons of coal a height of 65 ft.

The Development of Tubular Manganese Construction

FOR YEARS the manufacturers of manganese track work have been devoting considerable time and energy to the perfection of the design of manganese steel frogs and crossings, keeping in mind that the casting must be a practical one for the foundry to manufacture, of a design that will meet the specifications of the road on which they were to be used, and manufactured with care and skill so that the service rendered will result in greater economy for the user.

The element of doubt that existed some time ago in the minds of railroad maintenance officers regarding cast metal for track work had been gradually eliminated by the excellent record of service that manganese steel has rendered. With this obstacle removed, the perfection of detail was the next logical step, and the brains of the best talent in these lines were directed to overcoming the objections that arose from railroad engineers, frog and switch manufacturers and the foundries. Many designs were tried and in almost every case improvement was shown and something learned from the service rendered. The castings of a narrow angle did not present such a difficult problem in service as when they approached an angle of 90 deg., which was the most perplexing problem of all.

The necessity of the flangeways intersecting at right angles tended toward a construction that would have been ideal if the object had been to break the casting at this point. This necessary condition, coupled with the constant pounding of traffic, soon developed cracks at the intersection that were dangerous because generally no provision was made to tie the running surfaces together.

Another problem that appeared was the depression of the points of the running surface, also due to the pounding action of heavy traffic. The points pounded down within 30 to 60 days after installation, after which the metal apparently was compressed to the limit and the depression of the point stopped, but the effect was a rough riding crossing as long as it lasted.

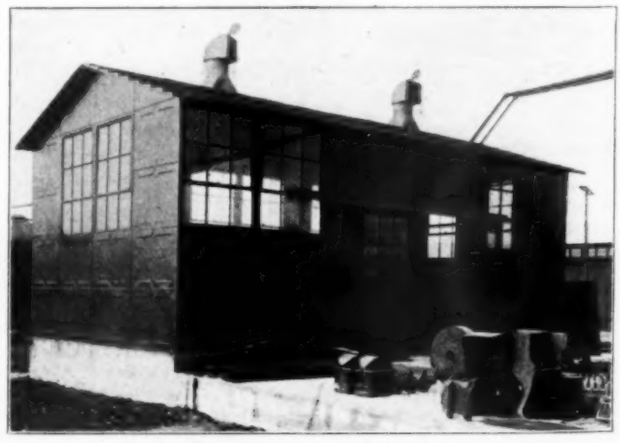
About two years ago the American Manganese Steel Company, Chicago, began to develop what is known as the "Amsco Process" crossing with the tubular design of intersection. The results of the first installation were so remarkable that immediate steps were taken to acquaint the track work manufacturers regarding this development.

In this process the portion of the casting under the intersection is constructed of a series of circular walls connected and covering the area under the entire intersection. The points of the running surface at the intersection when cast are provided with an excess of metal that is compressed by mechanical means before the castings leave the foundry, any excess metal that flows into the groove being ground away to maintain the proper alignment.

Over 200 of these castings are now in service, and examination of some of the earliest installations shows that the points have not depressed more than 3-32 in. in any case and in numerous cases the depression does not exceed 1-32 in. These castings are now used by various frog and crossing manufacturers, including the Ramapo Ajax Corporation, Hillburn, N. Y.

Pressed Steel Buildings Show Increasing Use

THAT PRESSED STEEL railway buildings promise to become common on railroads for a variety of uses is suggested by numerous installations made during the past year. This character of construction first attracted the attention of railway officers during the shop strike two years ago, when a number of pressed steel buildings were built for housing employees in the vicinity of shops. The rapidity with which such buildings could

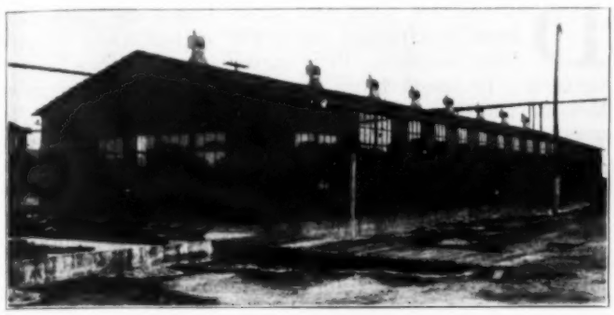


The Oil House at Pratt, Kansas

be shipped from the factory and set up, their fireproof character, their low cost and their high salvage value were important factors in bringing about their favorable consideration.

Among the roads on which pressed steel buildings have been erected during the past year is the Chicago, Rock Island & Pacific, which has erected buildings of this type for the stores department at Silvis, Ill., Shawnee, Okla., Pratt, Kan., and Amarillo, Tex. The largest of these buildings is located at Silvis. This building is about 50 ft. wide and over 100 ft. long. It is built on a concrete platform and is used for the storage of the large quantity of oil barrels handled at that point. At Amarillo and Pratt large steel buildings constitute the storehouses,

while oil is kept in smaller buildings. At both of these points the buildings are erected on concrete platforms and are equipped with window sash to afford ample light and assist in ventilating the interior. The installation at Shawnee, Okla., consists of a single building about 40 ft. wide and 70 ft. long, which is built in a depression where it required a high foundation to bring the floor of the building car door level high. This building, similar to the buildings at Pratt, Kan., and Amarillo, Tex., has numerous windows and all the buildings excepting

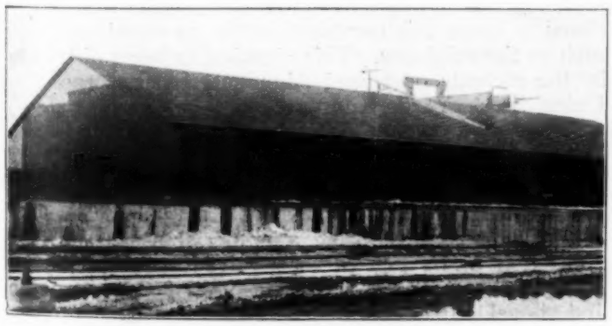


The Store House at Pratt, Kansas

the barrel storage building at Silvis are equipped with roof ventilators.

Other pressed steel buildings erected during the year include a 40-ft. by 70-ft. machine shop for the Ann Arbor at Owosso, Mich.; a large freight house with a two-story head house on the San Antonio & Aransas Pass; a building for the transfer of freight on the New York, Ontario & Western at Oswego, N. Y.; a machine shop on the Lake Erie & Western and three stores department buildings on the Santa Fe, one of two buildings built at San Bernardino, Cal., and a building built at Bakersfield, Cal., on this road being 40 ft. wide and 260 ft. long. The Santa Fe has also erected a 50-ft. by 150-ft. building of this character at National City, Cal., for a timber treating plant.

In general these buildings (all of which are designs of the Truscon Steel Company, Youngstown, Ohio), consist essentially of an assembly of pressed steel panels which



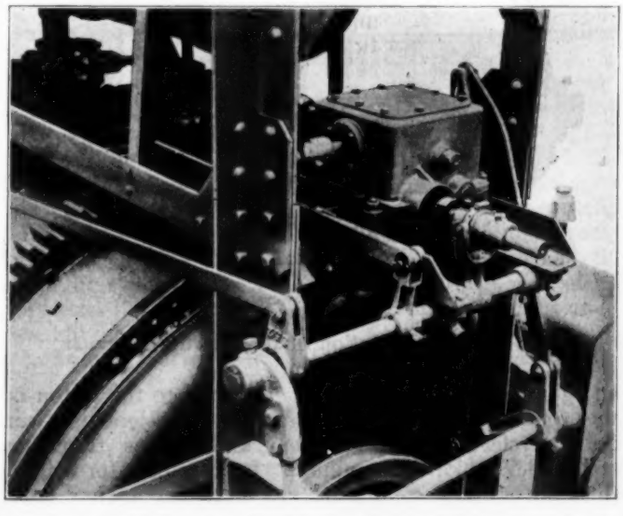
The Pressed Steel Building at Silvis, Ill.

vary in dimensions according to the size and type of building, but which in all cases are shipped from the factory ready for immediate erection, either under the supervision of a representative of the manufacturer or by company forces. The material from which the panels are made is copper bearing steel of 18 gage, as distinguished from the usual 24 to 26 gage metal used for building and roofing purposes. The panels are assembled on vertical steel trunions to which they are held by a system of keys and wedges, thus dispensing entirely with the use of bolts, screws or spikes. Various kinds of doorways and window sash are made to adapt the buildings for the different uses and the standard designs include not only the single bay buildings but two, three and four bay buildings, equipped with either monitor roofs, sawtooth or other special roofs. While the largest building in railway service thus far has a 50-ft. clear span, buildings are now being made with spans up to 76 ft., the roof structures in these cases being supported on trusses. A recent development in the design is a flat steel roof which is covered with standard types of composition roofing.

While the numerous installations of these buildings made thus far in railway service is attributed largely to their fireproof construction, their low cost and high salvage value, the readiness with which they can be dismantled and moved to other points or enlarged, their adaptability to a wide variety of lighting arrangements, the air and water tight character of the construction, and its strength are other important considerations.

A One-Man Concrete Mixer

A CONCRETE MIXER OF THREE-QUARTER yard's capacity which requires only one man to operate and control is a novel but useful development of recent months. This improvement is one of several features which are incorporated in the 1924 models of the Marsh-Capron mixers, where it is accomplished by the introduction of a power-operated discharge chute. On mixers



A View of the New Marsh-Capron Mixers Showing the Power Chute Controller

larger than one-half yard the manual operation of the discharge chute constitutes a task which almost invariably requires the employment of two men at the mixer. In the new Marsh-Capron machines this is done automatically under the immediate control of the operator.

The device accomplishing this consists of a pinion meshing with the top of the drum gear and a shaft extending therefrom to a gear box from which a connection is made directly to the discharge chute crank by means of one link. The gear box contains two jaw clutches and a train of cut steel gears which operate in a bath of oil. One clutch lowers the chute and the other raises it. By a four-inch throw of the operating lever, one or the other of the two clutches is brought in play. Positive automatic limit stops are provided outside the gear box, which

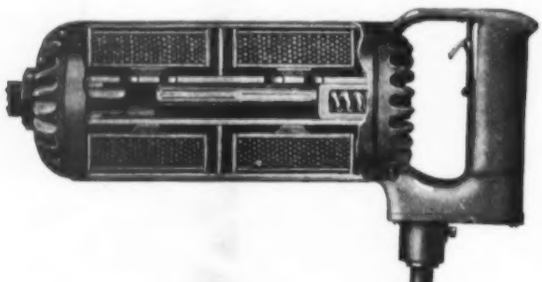
automatically stop the chute when it has been raised or lowered the proper distance.

This power chute is under control at all times. Reversible in less than one second, it thus affords the means of preventing those frequent mishaps which result in wasted concrete or in delays in operation.

Two other features of this power chute lie in the slight force necessary to throw the control lever and in the fact that its movement can be controlled from either side of the mixer or from the ground or an overhead platform, as if a batch hopper was used. The short travel of the operating lever is also an advantage in removing likelihood of persons being struck, as in the case where operating levers have a travel of several feet. The machines are products of the Marsh-Capron Company, Chicago.

An Electric Hammer of Simple Design

AN ELECTRIC HAMMER, designed on an entirely new principle, was put on the market recently by the National Electric Manufacturing Company, Pittsburgh, Pa. It has only one moving part, a core or piston which is mounted inside of a cylinder wound with two coils of wire which are energized alternately to impart a reciprocating motion to the piston. In its forward stroke, the piston strikes a tool, which may be a drill, chisel, rivet set or simular unit. In its backward stroke the piston strikes an elastic bumper in which it stores its kinetic energy until it is moved forward again when the



A Longitudinal Section of the Electric Hammer

energy stored in the bumper is returned to the piston on the forward stroke. The hammer is designed to run on 60-cycle alternating current and at this frequency strikes 3,600 blows per minute. It is suitable for drilling through masonry walls, drilling holes for anchor bolts, chipping castings, light riveting and assembly work, chipping and cracking stone, calking pipe and tank plates, etc. A similar tool designed for 25 cycles which will strike 1,500 blows a minute can be used for heavier riveting.

The piston is made of special hardened steel and is said to last indefinitely. Aside from an occasional oiling it needs no attention. A trigger switch on the handle of the hammer starts and stops the hammer. The hammer meets the need of a portable hammer drill that can be carried from job to job. It can be connected to any lamp socket and is then ready for work.

In a recent test one of these hammers was run for 948 consecutive hours without any apparent effect other than a minor wearing of the heads of the piston and tool. The hammer is at present available in three sizes, one weighing 10 lb. a second weighing 17 lb. and a third weighing 24 lb. All sizes are available for current of 110 or 200 volts and any frequency. The power consumption of the 17-lb. hammer is 300 watts. Two carrying kits are supplied to hold the hammer and a control box, together with a 50-ft. extension cord and a complete assortment of drills, chisels and stone points. This tool is known as the "Syntron" electric hammer.

Preventing Incrustation in Water Supply Lines

DURING THE LAST few years many railroads have been confronted with the incrustation of pipe lines, reducing their capacity until it has become necessary to spend large sums in an attempt to remove this incrustation and in some cases to replace a line. To overcome this condition a new chemical is now being introduced. This chemical is sodium aluminate, a substance which has long been known to chemistry but which, until recently, has not been available in sufficient quantities to warrant consideration of its possibilities in this field. This compound is now being produced in large quantities as an intermediate product in the manufacture of metallic aluminum.

Extensive investigations have shown this chemical to be proficient as a clarifying agent in the purification of water and also a useful re-agent in the softening process itself. The addition of a small amount of this material to the lime and soda ash used in most water treating plants (which may be done without the alteration of existing equipment) is said to accelerate the reactions which are necessary to precipitating compounds which, when left in the water, give rise to the scaling of boilers, to foaming and to leaking, etc. In addition, the chemical, by reason of its flocculent characteristic, promotes the removal of the precipitates formed by chemical reactions.

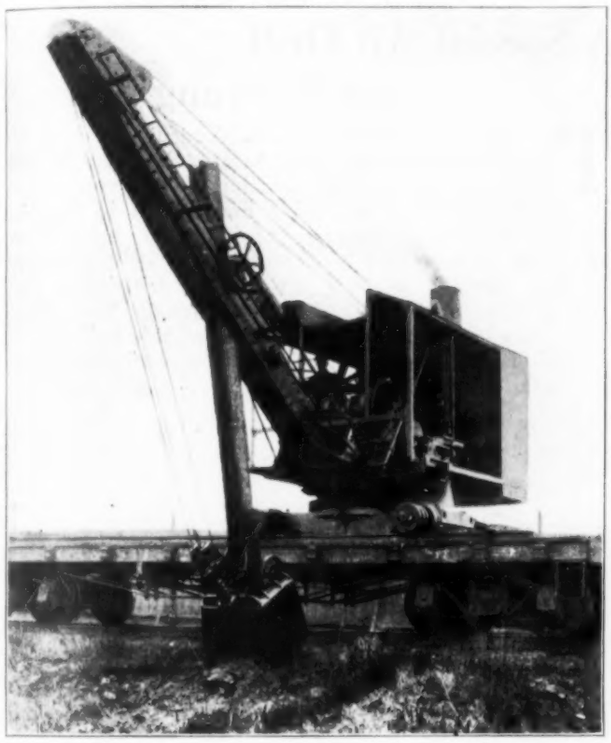
It is in the latter respect that the use of this chemical promises to afford a solution of the pipe cleaning problem, since it is tre after-precipitation in such lines after water leaves the treating plant that is responsible for the incrustation that takes place. Sodium aluminate also holds promise of aiding in the solution of the present troubles with foaming and corrosion resulting from the use of improperly treated water, if credence can be given to the growing impression that alkali salts are less inclined to cause this trouble than the so-called acid salts, such as the sulphates. This chemical is being distributed by the recently organized Aluminate Sales Corporation, Union Stock Yards, Chicago.

An All-Round Railroad Ditcher

THE MCMYLER INTERSTATE COMPANY, Cleveland, Ohio, is introducing a power shovel as an addition to its line of locomotive cranes. This machine is known as the Interstate No. 2 convertible crane and shovel. It is operated by steam and is adapted for mounting on the top of a flat car, as illustrated, or on standard gage trucks. In either case the machine is self-propelling.

As the name implies, the machine is adapted for use as a ditcher shovel or as a crane. The machine will ditch right-of-way, excavate, handle coal and ashes or remove slag with either the crane or the shovel boom. With a fall block the ditcher can be used for laying rails, loading, unloading or storing ties, handling lumber or for general locomotive crane service. If desired for store-yard use, a generator and magnet may be installed. When fitted with a crane boom 30 or 35 ft. long, the machine will handle a three-quarter yard or one yard clam shell

bucket or a 16 or 21 cu. ft. orange peel bucket. The standard equipment dipper on this type is of three-quarter yard capacity, but if the ditcher is intended for regular use in handling light material, such as ashes, larger buckets may be used. The machine normally includes two main power-driven hoisting drums with steam



The New Interstate Shovel Arranged for Ditching

clutch control as well as a worm-driven boom hoist, which enables the ditcher to be converted into a crane capable of performing all of the functions of the standard type by the substitution of a crane boom for the shovel boom and dipper stick. This change can be made easily in the field without special rigging or equipment.

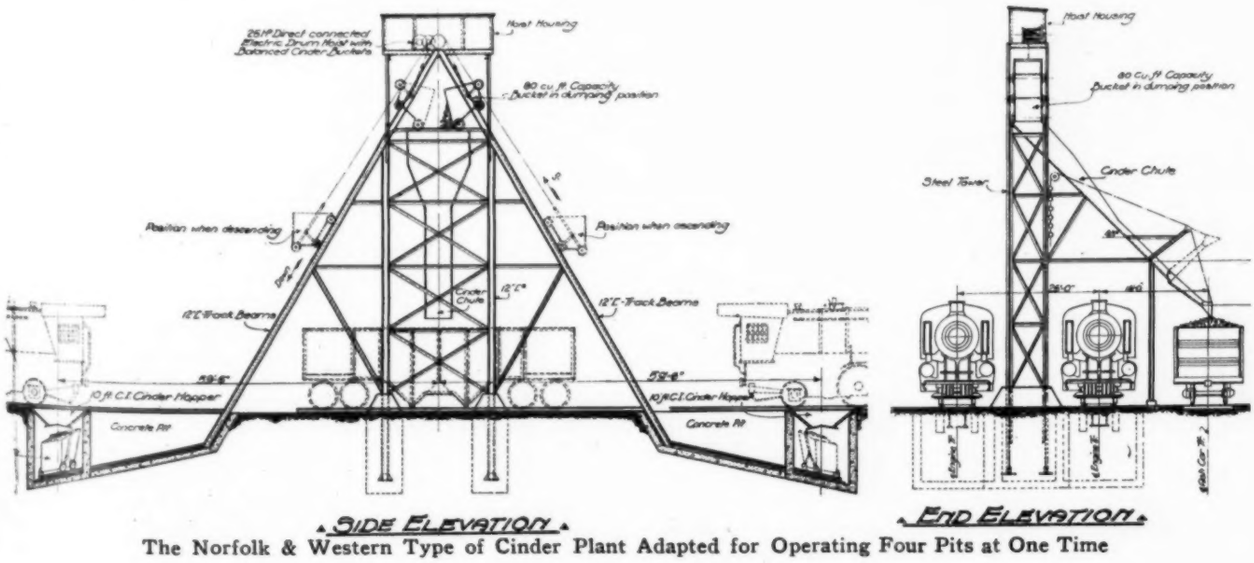
The turntable is so mounted that the machine can swing in a full circle in either direction. All operating levers are arranged for the convenience of the operator as well as for rapidity of performance. The illustration shows the operating platform at the right hand side of the turntable at the extreme front. This affords the operator an unobstructed view of his work under all conditions. All digging operations are controlled by three levers directly in front of the operator, while separate levers control the travel and boom hoist functions. The cab is of steel, so designed that the crane mechanism may be partially or fully enclosed.

Four Pit Automatic Cinder Plant

SINCE FIRST DEVELOPING its "NW" type cinder plant the Roberts & Schaefer Company, Chicago, has had occasion to adapt the fundamental design of this equipment to a variety of more or less complicated arrangements. The latest development in this direction is its adaption to serve four pits where coal as well as cinders may be handled. The principal new feature, aside from the number of pits served, lies in the ability to handle the cinders from four locomotives dumping at one time with one machine and one motor hoist.

The illustration shows the general plan of the layout, the essential details of which are a structural steel tower occupying a position midway between two parallel tracks on 26 ft. centers, a pair of cinder pits under these tracks, a structural steel incline rising from each pair of pits to the top of the tower and a cinder chute extending from the top of the tower to a point above a third track parallel to and 16 ft. distant from the nearest cinder track.

Each of the cinder pits consists of a cast iron hopper 10 ft. long, in a concrete pit below the cinder track. Each of these pits has a capacity sufficient for all the cinders dumped from one locomotive, which are held until removed by means of a bucket of 80 cu. ft. capacity. This bucket serves the two pits by means of a switch and is raised and lowered by means of a 25-hp. direct connected electric drum hoist located in a housing on top of the steel tower. The design of the bucket is such as to keep it in the vertical position during loading and descending and two buckets are so connected by a cable as to balance each other, thus reducing to a minimum



The Norfolk & Western Type of Cinder Plant Adapted for Operating Four Pits at One Time

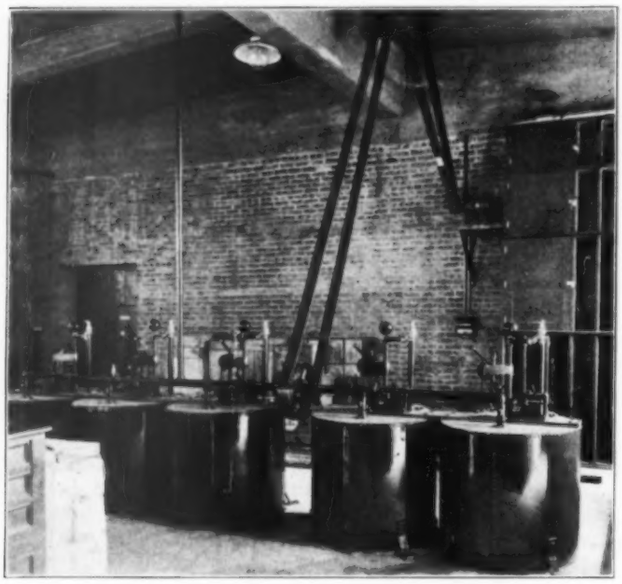
the power required in operating them. Having reached the top of the incline, the buckets dump automatically into the cinder chute, the lower end of which raises and lowers similar to typical coal chute gates.

The principal advantage of this arrangement is the means it affords of dispensing with large deep-water pits, although it may also be utilized for handling coal in conjunction with cinder disposal. Both the hoisting operations and the switching of the tram car are controlled from the ground by one man.

Promoting Economy in Paint Distribution

PAINT HAS ALWAYS been a source of more or less trouble for the railroads to handle at points where it is kept in storage and used periodically. The usual practice has been to receive and hold this material in barrels, a practice which has resulted in much wastage from broken or sprung barrels and also in trouble owing to the tendency of the pigments to settle. Where agitation has been attempted this has been accomplished by loss of paint owing to chemical and physical changes resulting from contact with air, while at the same time loss has also resulted from the primitive methods of measuring out the oil in small lots.

These problems have been solved on the Pennsylvania by the installation of a series of five combined mixing tanks and measuring pumps, as shown in the illustration. Each of these tanks consists of a steel cylinder

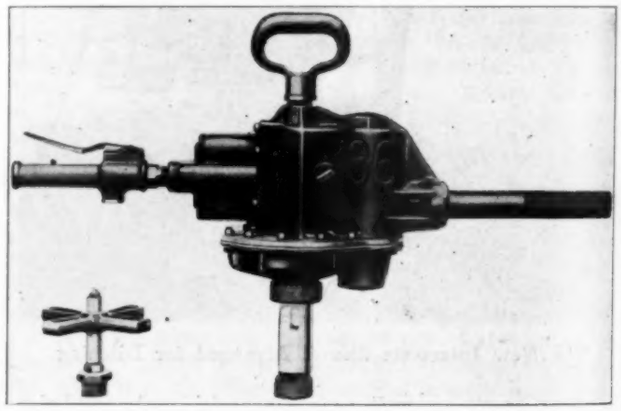


A Battery of Paint, Oil and Mixed Paint Equipment Ready for Use

of sufficient capacity to hold all of the paint of one kind desired and keep it from contact with the air at all times. Each cylinder is equipped with an agitating device and all of the cylinders are arranged in a row so that all agitators can be operated from one shaft, which, in turn, is operated by an electric motor. In addition, each cylinder is equipped with a self-measuring pump similar to pumps in use for distributing oil except that the pumps, of necessity, are specially designed for handling paint. All of the tanks are filled from a pipe line which avoids any wastage of oil in this operation. The tanks are so arranged as to require one, when securing paint, only to turn on the electric motor momentarily and then to measure out the required quantity of paint by means of the hand-operated, self-measuring pump, situated on the ground level at one side of the tank. This equipment is the product of the S. F. Bowser & Co., Ft. Wayne, Ind.

A Special Air Drill for Reaming Service

THE EXTENT TO WHICH portable drills are used in reaming operations, both in the shop and in the field, and the special demand of this work arising particularly from the wide fluctuations in load in reaming different thicknesses of materials, has led to the recent development of a portable air drill which is designed specially for this work. This drill is the No. 36 Red Giant drill of the Chicago Pneumatic Tool Company, New York. While the design of this drill is not revolutionary it is distinctive in a number of particulars. The main objectives sought in its development are said



The Red Giant Drill for Reaming

to be capacity for uninterrupted service, ease of operation and reduced maintenance.

The new drill weighs 35 lb. and is unusually well balanced, affording easy control and enabling it to be handled by one man for most down or side hole reaming. The spindle is of the extension type with a slot for the convenient ejection of the reamer or drill. One of the most prominent features of the drill is the power, which is unusually large for drills of this weight. This makes the machine especially adaptable where the work varies from single plates to multiple plates and gussets with forging, gray iron and steel casting interspersed between them, and where the quantity of metal to be removed produces a constantly changing power factor. All of the working parts are made extra large to provide an ample safety factor. As the motor is double acting and is provided with a packing gland or stuffing box, there is no leakage of air into the crank case. The lubrication is of the flash type and as there is no air to bleed through from the crank chamber there is no loss of lubricant as a result of its being carried out into the escaping air. The crank shaft and bearings differ slightly from those of the standard Little Giant designs, having the eccentric located between the throws and an integral part of the forgings. This crank shaft is mounted on three ball bearings, the extra or third ballbearing insuring proper shaft support on both sides of the main drive gear and contributing to an unusually low frictional resistance in the machine.